# HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS



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## THIS MONTH'S COVER

Hot water heating circulating lines and control valves installed in the Plymouth Office Building, Detroit, Mich. Photo courtesy Crane Co. For a discussion of valves used in heating and ventilating installations see article by Richard Irmiter beginning on page 77.

# WHY BUY

## ASKED THE MAINTENANCE SUPERINTENDENT

### *"Here's why"* said the man from Sturtevant

"DESIGN—is the key because the new Elbow AXIFLO has a novel cone housing arrangement that keeps bearings, motor or belts out of the airstream. Result: Low-cost maintenance because bearings are easily accessible and unaffected by heat, dust, fumes. The Elbow AXIFLO can be used to handle hot gases up to 900°F."

"CONSTRUCTION—Elbow AXIFLO fans can be installed with the inlet at any desired angle. Rigid support gives you universal mounting in horizontal or vertical position, on floor, wall or ceiling."

"PERFORMANCE—AXIFLO offers high mechanical and static efficiency with maximum volumetric pressure. Thus, AXIFLO has all the advantages of larger, more expensive centrifugal fans—especially at lower pressures where centrifugals are not usually applied."

"ECONOMY—AXIFLO costs less initially, costs less to operate. You can adapt them easily for special applications where lack of space or suitable support might otherwise call for expensive structures and platforms. Lower maintenance cost is another big economy feature because bearings are accessible."

"VERSATILITY—There are hundreds of jobs in modern industry, from air conditioning to heat treating, that AXIFLO handles with equal facility. You can use AXIFLO fans for paint spray booths, to handle hot gases, or for elimination of inflammable or explosive fumes. AXIFLO fans come in Elbow design and straight-through type. There's a wide range of sizes for both, and you can get them fitted with either 3-bladed non-sparking aluminum wheels, or 8-bladed high efficiency steel wheels. AXIFLO is, in fact, the most versatile, the most cost-cutting fan ever made for industry."

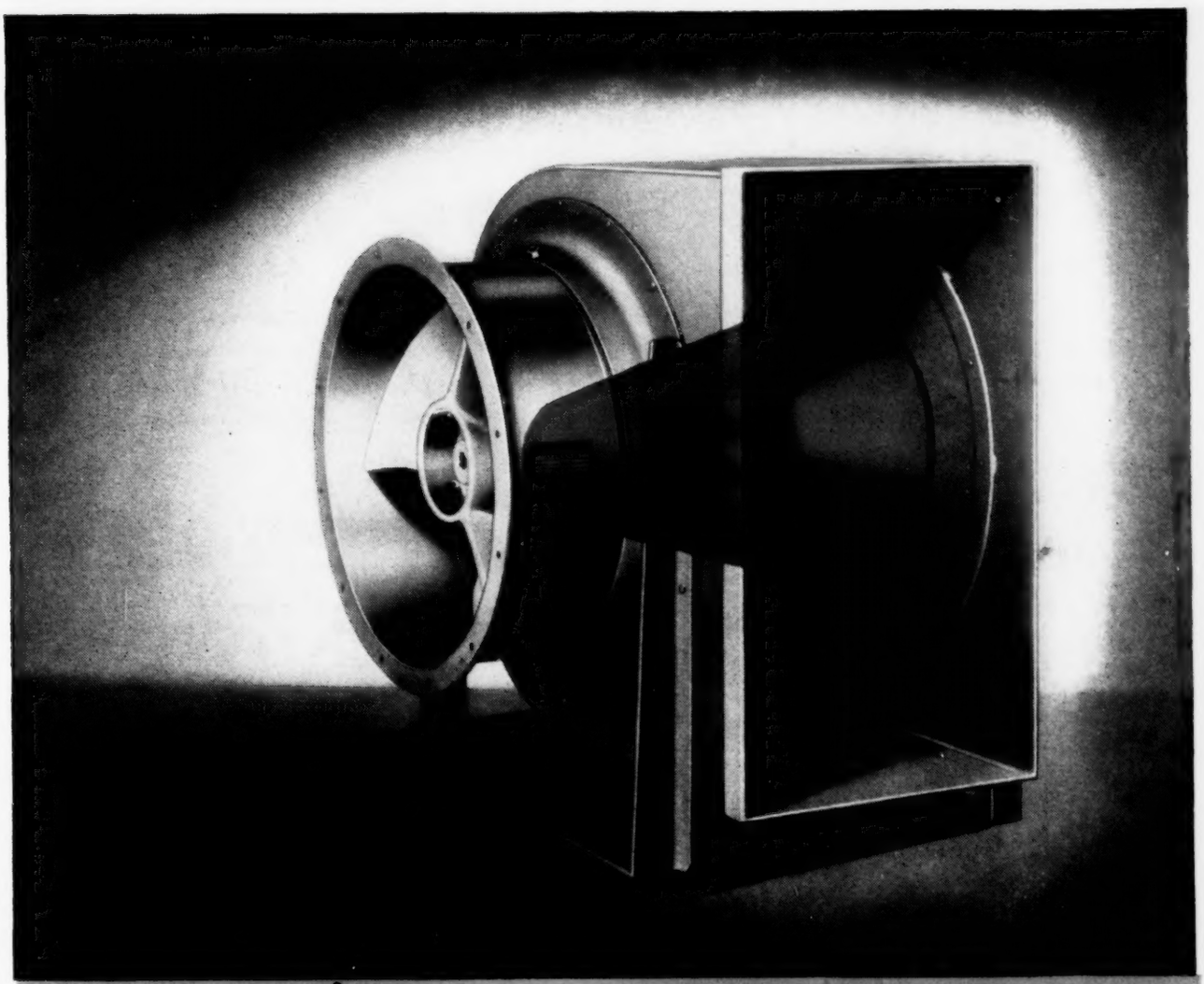
*Trade mark of the Westinghouse Electric Corporation, Sturtevant Division. Reg. U. S. Pat. Off.*

*Write Today!*

**for *your* copy of the new booklet: "The Answer is AXIFLO" —it describes AXIFLO pressure fans and their many uses.**

**Westinghouse Electric Corp.**
**Sturtevant Division**
**Hyde Park, Boston 36, Mass.**

# AXIFLO*?



*the CONE does it*

**Westinghouse**
**Sturtevant Division**

J-80015

# Oil saving and more comfort for *users* of oil heat

**Comfort Is Profitable**

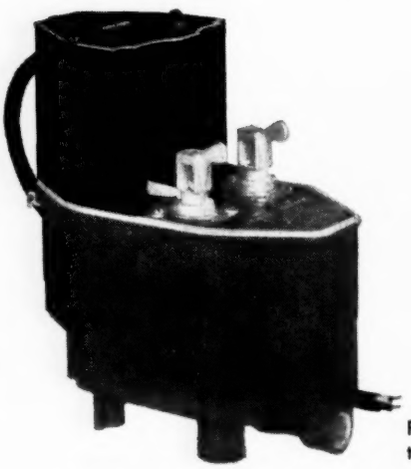
**more profit for you by making the heater automatic...**

**Many Thousands of Oil Heater Users Need This Equipment**

- "DETROIT" ADD-ON CONTROL
- ROOM THERMOSTAT
- FUEL TRANSFER PUMP
- THREE-WAY VALVE

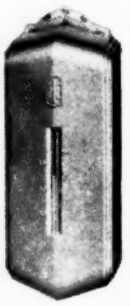
## TAKE ADVANTAGE OF THIS HUGE MARKET

Here are four items you can sell, singly or in combination, to those who now have manually controlled oil heat. By providing thermostat regulation, comfort is increased and *oil saved;* and oil saving has become very important. The fuel transfer pump makes fuel supply automatic. The three-way valve permits installation of a reserve tank.



**"Detroit" CRC-239-P and CRC-239-PF Add-On Controls**

Fasten to the top of manual type CRC-239 Float Valves. Make either single or dual valves automatic under control of No. 411 Thermostat. Easily applied, reliable in operation—and profitable to sell.

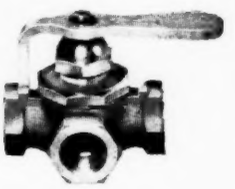


**"Detroit" No. 411 Room Thermostat**

Provides accurately leveled temperature control, eliminates costly overheating. Saves oil. Easily installed—easily adjustable. With the Add-On Control, it provides automatic oil heat with a manual type CRC-239. The combination has a strong appeal to owners of space heaters and floor furnaces.

**"Detroit" CRC-433 Fuel Transfer Pump**

Makes fuel supply automatic — no more hand carrying of oil to the heater. No spilling, no mess. Automatically supplies oil from main tank. No attention needed after installation.



**"Detroit" CRC-520 Three-Way Valve**

Permits installation of second oil tank for reserve, or for less frequent delivery. Valve has three positions—right hand tank—left hand tank—and all off. Cast brass body —3/8" or 1/2" F.P.T. connections.

2972

***Write for details on these profitable items.***

## DETROIT LUBRICATOR COMPANY

*General Offices:* **5900 TRUMBULL AVENUE, DETROIT 8, MICHIGAN**

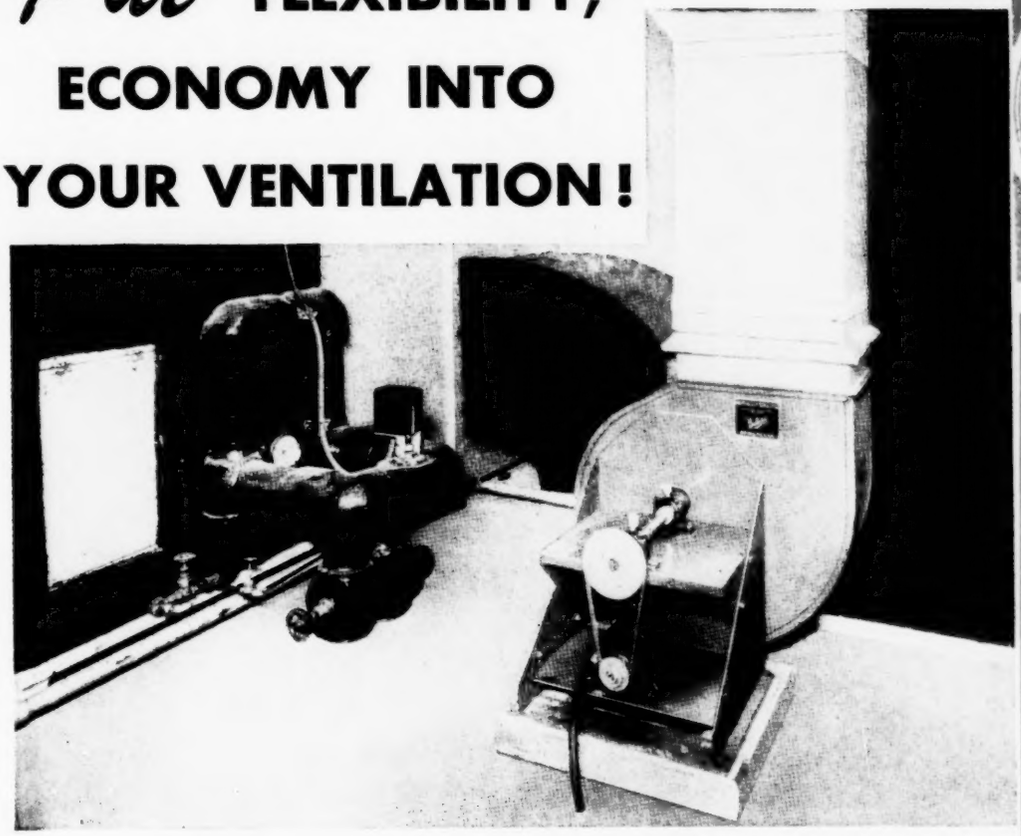
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

"DETROIT" HEATING AND REFRIGERATION CONTROLS • ENGINE SAFETY CONTROLS
FLOAT VALVES AND OIL BURNER ACCESSORIES • "DETROIT" EXPANSION VALVES
AND REFRIGERATION ACCESSORIES • STATIONARY AND LOCOMOTIVE LUBRICATORS

*Canadian Representatives*—RAILWAY AND ENGINEERING SPECIALTIES LIMITED, MONTREAL, TORONTO, WINNIPEG

"DETROIT"

# *Put* FLEXIBILITY, ECONOMY INTO YOUR VENTILATION!

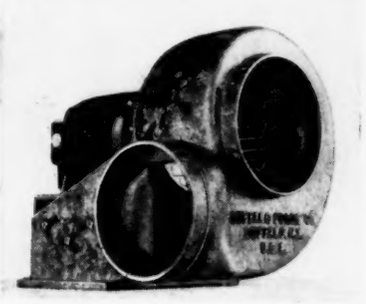


*Buffalo Vent Sets Take Little Space, as Shown Above*

## BUFFALO VENT SETS Solve Many Problems

● Here's a "one-piece" fan that is quickly and easily set up in tight space — temporarily or permanently — indoors or outdoors (with All-Weather Cover over motor and drive). It allows economical multiple fan installations to suit changing needs. Put this fan on commercial or industrial ventilation—for low-cost, flexible operation. In capacities from 600 cfm to 12,000 cfm. Write for bulletin 3499.

**BUFFALO BABY VENT SETS** are husky, portable, readily adjustable for various discharge positions. Ideal for ventilating small rooms, withdrawing fumes, vapors, dust. Very compact.



**FANS by "Buffalo"**

**EQUIPMENT FOR**

- ★ VENTILATING
- ★ HEATING
- ★ COMFORT COOLING
- ★ PROCESS COOLING
- ★ AIR TEMPERING
- ★ AIR WASHING
- ★ EXHAUSTING
- ★ BLOWING
- ★ FORCED DRAFT
- ★ INDUCED DRAFT
- ★ PRESSURE BLOWING
- ★ CLEANING
- ★ DRYING

# BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

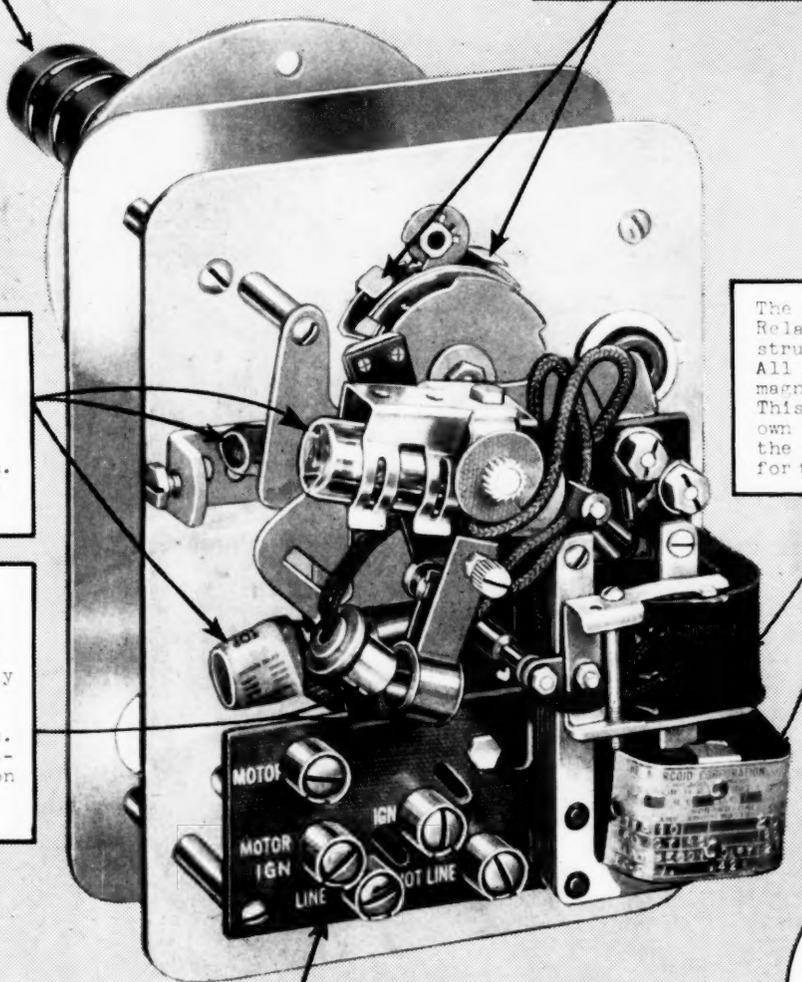
# DESIGNED FOR THE JOB

# MERCOID PYRATHERM

**Type JMI (For Intermittent Ignition Burners)** **Type JM (For Constant Ignition Burners)**

Special high temperature bimetal coil employed assuring constant sensitivity and long life.

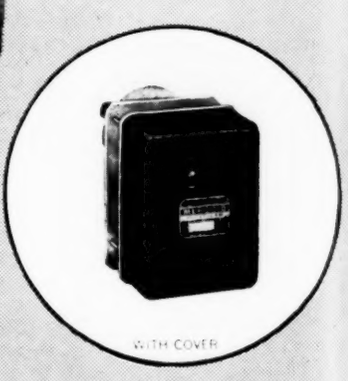
Simplified differential adjustments are provided so that control can be adjusted in the field to meet the wide variations and fluctuations in stack temperatures.




Only three electrical circuit contacts used (sealed mercury switch type) for motor, safety and ignition. These switches are immune to dust, dirt or corrosion. All contact trouble is eliminated.

The Mercoid Transformer-Relay is unique in construction and operation. All noise and residual magnetism are eliminated. This relay, acting as its own transformer, induces the necessary low voltage for the thermostat circuit

The safety timing mechanism is fool-proof. It determines the time the burner can operate without flame. It is correctly set at the factory, but may be changed to meet certain field conditions. In case of a safety shutdown, a hand reset button is conveniently located to resume operation.



WITH COVER

All terminals are plainly marked to facilitate correct wiring.

**WHEN YOU SPECIFY MERCOID CONTROLS, YOU AVAIL YOURSELF AND YOUR CUSTOMERS OF FINE INSTRUMENTS**

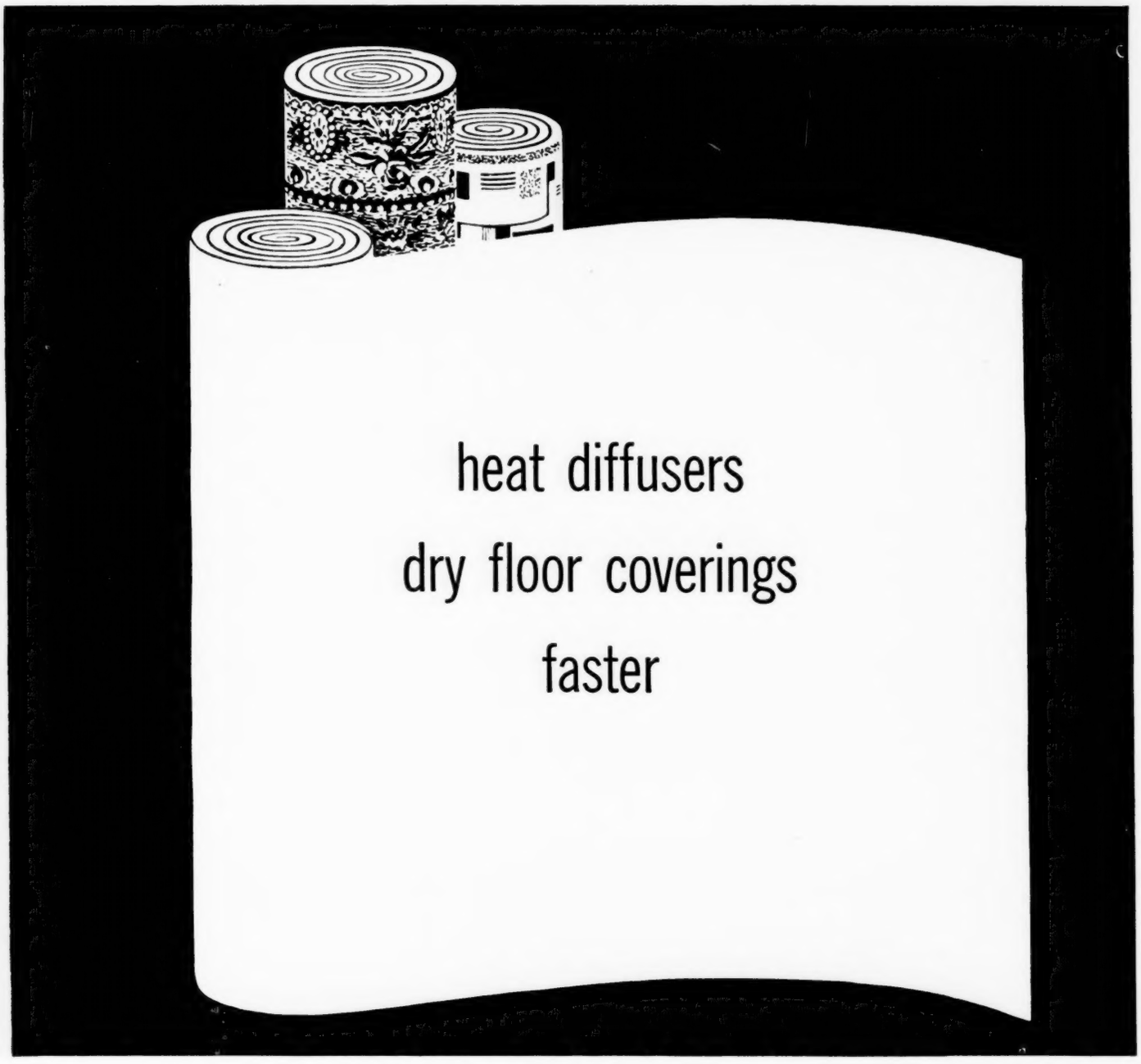
# MERCOID

A 100% SAFETY AND IGNITION CONTROL AGAINST FLAME OR IGNITION FAILURE • IT ALSO OFFERS POSITIVE LOW VOLTAGE PROTECTION

**THE MERCOID CORPORATION · 4201 W. BELMONT AVENUE · CHICAGO · 41 · ILLINOIS**

*Manufacturers of dependable automatic controls for a quarter of a century*

● **SEE OUR EXHIBIT, BOOTH 346-348 AT THE SILVER ANNIVERSARY NATIONAL OIL HEAT EXPOSITION, CHICAGO COLISEUM — APRIL 5-8, 1948**



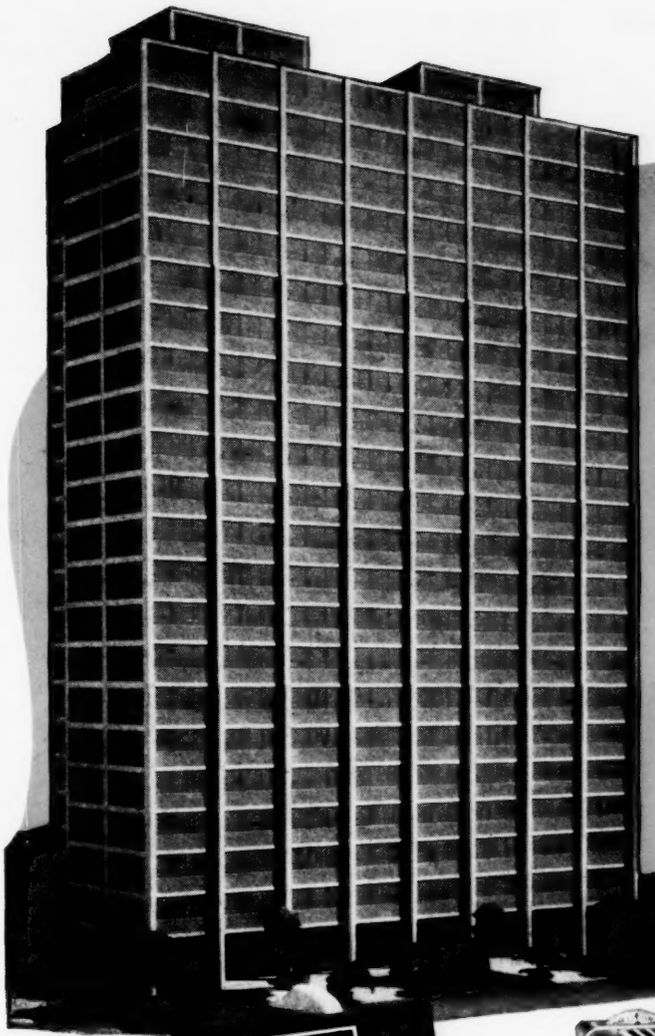

Carrier Heat Diffusers are speeding production throughout the linoleum and felt base floor-covering industry. They're improving quality in many instances and slashing fuel costs.

In stoves, curing tunnels, and flat-rack dryers, these efficient standard units are saving up to two days in curing or drying. Print goods are given a better finish. With felt coating, linoleum and new plastic flooring, the story is the same . . . faster curing, better control of processing. And, in many plants, Carrier Heat Diffusers are supplying controlled heat demanded for print and storage rooms.

Many other industries, too, are finding these scientific units the economical answer to many heat-processing problems. They're available for floor or suspension mounting in capacities up to 1,570,000 Btu per hour. Heat can be held within close limits with either the Carrier non-freeze steam-distributing tube coils and modulating valves—or Carrier Thermadjust with modulating control at full steam pressure. Units can be used with or without duct work. They come as complete units—ready to operate.

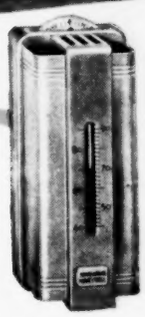
Carrier Heat Diffusers are designed and built with all the engineering skill that has made the Carrier name respected wherever air conditioning, refrigeration and industrial heating are used. This skill and Carrier world-wide experience are your assurance of dependable heating and drying. Carrier Corporation, Syracuse, N. Y.

**Carrier** AIR CONDITIONING • REFRIGERATION • INDUSTRIAL HEATING



## New Radiant Heated Apartment will have . . .

# HONEYWELL P.H.C.*



**PROMONTORY APARTMENTS, Chicago**

Herbert S. Greenwald; *President, Promontory Construction Corporation*

Raymond Epstein, Robert H. Friedlaender, Morton B. Weiss; *Trustees, Promontory Apartments Trust*

Plonsker Engineering Company; *Heating Contractor*

UNIQUE in both design and construction, the 21-story Promontory Apartments, now under way on Chicago's South Shore Drive, represent a splendid modern example of reinforced concrete construction.

Specially designed steel frame picture windows used throughout the 122 suites take full advantage of the lake shore view overlooking Promontory Point. Other distinguishing features include sound-insulated double walls and radiant heating with Honeywell Personalized Heating Control. With a thermostat in each apartment, every tenant will select just the individual temperature desired. This means not only the comfort of home heating in every apartment, but important operating economies as well. Tests prove that among present installations P.H.C. systems are saving fuel at an average rate of *20 percent.*

And in existing buildings, too, Personalized Heating Control brings these same benefits. Installation is fast, simple—without inconvenience to tenants. Get complete facts about P.H.C. now. Write Minneapolis-Honeywell, Minneapolis 8, Minnesota. In Canada: Toronto 12, Ontario.

### Here's why you'll want to give your clients Honeywell P.H.C.

- Saves fuel—heating costs average 20% less
- Increases tenant satisfaction—easier rentals
- Promotes longer leases, less turnover
- Tenants will pay higher rentals for P.H.C. comfort and convenience.

MINNEAPOLIS **Honeywell**

CONTROL SYSTEMS

* PERSONALIZED HEATING CONTROL—Honeywell's *home-heating comfort* contribution for apartment dwellers.

67 BRANCHES FROM COAST TO COAST WITH SUBSIDIARY COMPANIES IN TORONTO • LONDON • STOCKHOLM • AMSTERDAM • BRUSSELS • ZURICH • MEXICO CITY

# INSTALL STEEL PIPING ADEQUATE FOR TOMORROW'S NEEDS

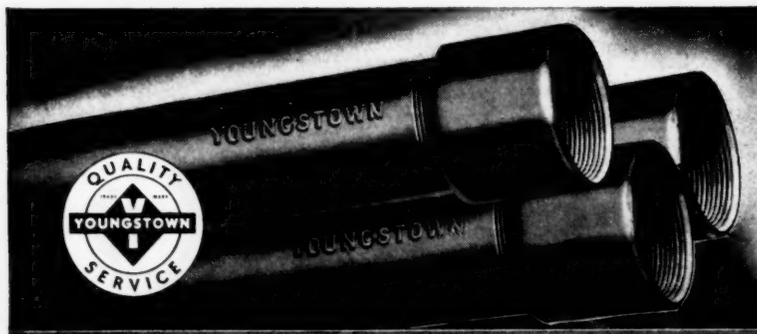
## He's spending extra dollars now.... to save big money on pipe later

HERE'S a manufacturer who's installing "oversize" steam lines in his new plant--paying a little extra money for larger steel pipe than his present requirements demand. Why? Because he's reasonably sure that inside of a few years the anticipated growth of his business will make it necessary for him to expand--put additional equipment in present floor space, then perhaps add another floor, possibly another wing.

So, today, this man is saving money by spending. He's doing some forward-planning--thinking in terms of what he will need later on, not of the minimums he can get by with today.

It's only common sense to look ahead when it comes to investing in equipment as permanent as steel pipe. Yet too few people do it! And it certainly is long run economy to install pipe that's adequate to do a job for today AND TOMORROW TOO.

Distributors in all industrial markets handle Youngstown pipe in a wide range of sizes.




**YOUNGSTOWN**

**THE YOUNGSTOWN SHEET AND TUBE COMPANY**

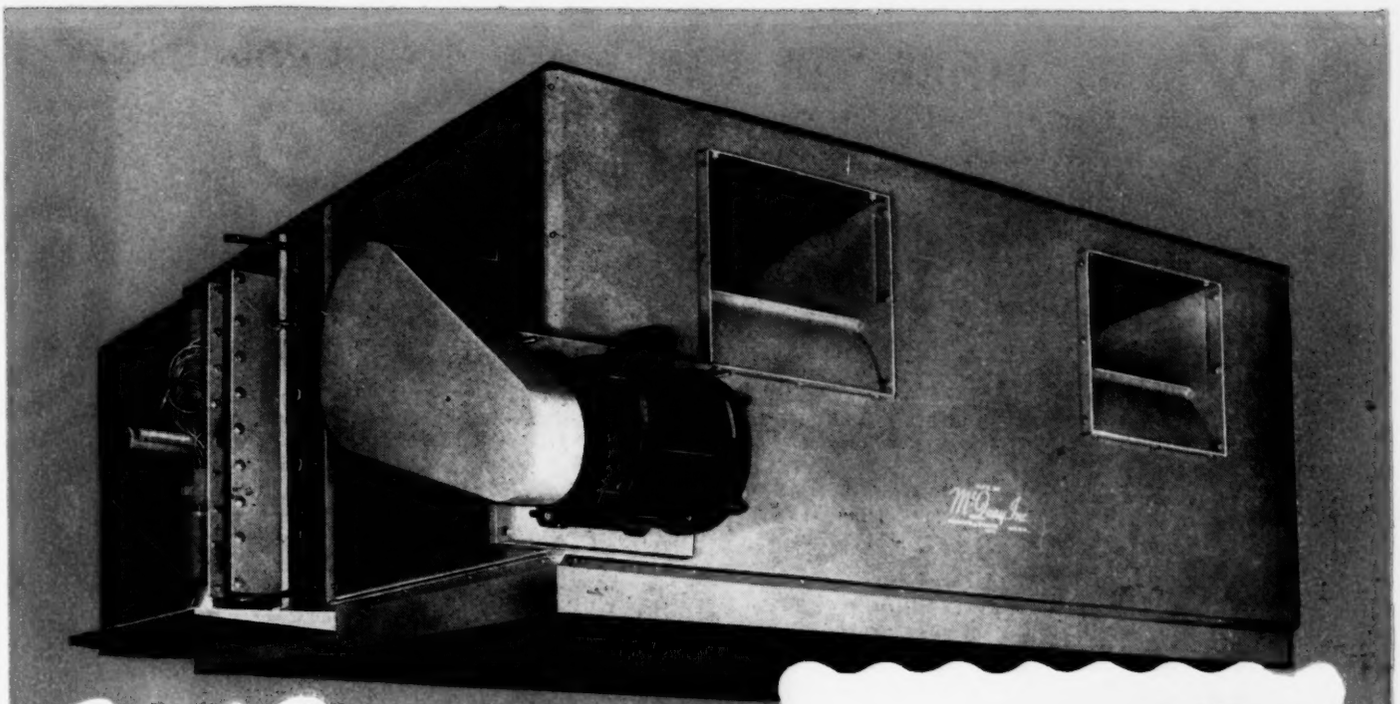
GENERAL OFFICES - YOUNGSTOWN 1, OHIO

Export Offices - 500 Fifth Avenue, New York City

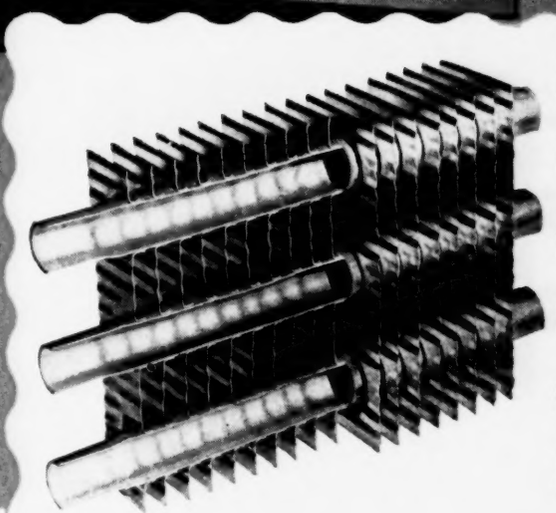
Manufacturers of

CARBON - ALLOY AND YOLOY STEELS

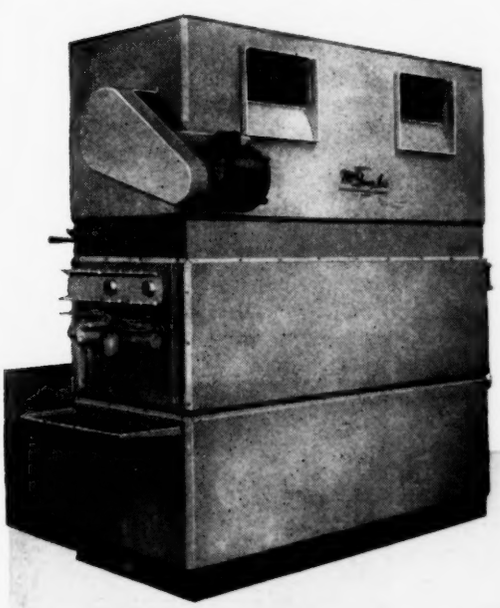
Pipe and Tubular Products-Sheets-Plates-Electrolytic Tin Plate-Coke Tin Plate-Conduit - Bars - Rods - Wire- Cold Drawn Carbon Steel Rounds-Tie Plate and Spikes.



# McQuay year 'round AIR CONDITIONERS with RIPPLE-FIN coil construction



## MAKE THE SEASONS COME TO YOU



**Complete flexibility** of operation with McQuay air conditioning units, assures the comfort you want. From factory to small shop, McQuay units provide the right degree of fresh, conditioned air necessary for efficient working atmosphere. Secret of McQuay air conditioning performance is the versatile Ripple-Fin coil, with tubes hydraulically expanded into fins for unmatched heat transfer efficiency. Continuous plate-type construction, tough, vibration-free Ripple-Fin coils mean added years of dependable service. McQuay Year 'Round Air Conditioners are available in horizontal or vertical type models in a wide range of capacities for new or remodeling installations. See the McQuay representative in your area, today, or write McQuay, Inc.

McQuay Inc.

1619 Broadway Street N. E. • Minneapolis 13, Minnesota

IN HEATING • AIR CONDITIONING • REFRIGERATION • IT'S THE REAL McQUAY

# no matter how large or small the installation

## THERE IS A DUNHAM SYSTEM TO TAKE CARE OF IT—DUNHAM PRODUCTS TO MAINTAIN IT!

Dunham Baseboard Convectors are easily installed, take no more space than the baseboard. The piping is on the inside of the baseboard spreading the heat along the inside of the outside walls. Every room, every corner; even the floors in houses built without basements, are assured of comfortable temperatures. Finned radiation concealed behind the attractive baseboard with concealed louvers, is engineered to keep walls clean and decorating costs to a minimum. The Dunham Baseboard method of heating provides a blanket of warmth for the home using either hot water or steam. Bulletin 639P with complete details will be sent on request—C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Ill.

The Dunham Differential Vacuum Heating System has the important advantage of *sure immediate* and *automatic* control or room temperature under all weather conditions including sudden and extreme changes. This system, circulating sub-atmospheric steam, has established both tenant satisfaction and reduced heating and maintenance costs in hospitals, hotels, large apartment projects, office and industrial buildings. Fuel savings from 33% and more are commonplace. Write for Bulletin 631P and get the complete story on satisfactory, trouble-free Differential Heating—C. A. Dunham Company, 400 W. Madison Street, Chicago 6, Ill.

DUNHAM PRODUCTS ENGINEERED TO GIVE EFFICIENT, LOW MAINTAINENCE PERFORMANCE.

BASEBOARD CONVECTORS • CONVECTORS • FLOAT & THERMOSTATIC TRAPS • HIGH PRESSURE STEAM TRAPS • HEATING & VENTILATING UNIT ONE TUBE HEATING ELEMENT • PUMPS • PACKLESS RADIATOR VALVES THERMOSTATIC RADIATOR TRAPS • UNIT HEATERS DIFFERENTIAL VACUUM STEAM HEATING SYSTEMS

**DUNHAM**

*HEATING MEANS BETTER HEATING*

# The Wheatland Policy

Two years have gone by since this advertisement was originally presented . . . and each year circumstances have varied. However, the WHEATLAND policy remains unchanged.

"Do unto others as you would have others do unto you." That is the backbone of the WHEATLAND policy.

The seesawing economic conditions of the present have not touched the integrity of WHEATLAND. Our tested steel pipe is a consistently superior product, and we carefully adhere to equitable distribution.

Foresight in planning, fairness in trade, these shall continue as our standards —on this basis we have overcome the difficult—with this "Golden Rule" we face the future.

Edward J. Mauney

PRESIDENT, WHEATLAND TUBE COMPANY

*-pipe with the yearmark!*

WHEATLAND-4&

**WHEATLAND TUBE COMPANY**

Bankers Securities Building · Juniper & Walnut Streets · Philadelphia 7, Penna.

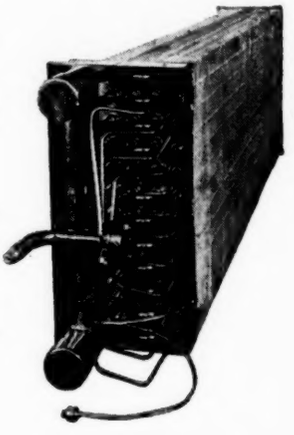
# EVEN DISTRIBUTION COUNTS

## You get even cooling throughout every G-E direct expansion coil

Balanced refrigerant distribution is just as necessary for efficient cooling as these girls are for the tightrope walker's chances of finishing his ride.

The multiple outlet "Freon" distributor built into every G-E Direct Expansion coil is just one more effective "weapon" in General Electric's "war" on coil famine . . . for it is only through such quality features as refrigerant control and even distribution that such capacity robbers as liquid slugging and starved coils can be held in check. Then too, G-E "Freon" distributors are easy to clean and inspect.

Other heroes in G. E.'s campaign for better cooling are the continuous formed fins for extra stiffness and air turbulence, and the electro-thermally bonded collars that mean high heat transfer efficiency at lower cooling costs.



*General Electric Company, Air Conditioning Department, Section A8913 Bloomfield, New Jersey.*

**GENERAL ELECTRIC**

***Refrigeration and Air Conditioning***

# *Authoritative, useful Reference Material*

# PERTAINING TO PIPING

**Published as a service to industry by the people who pioneered in welding fittings and manufacture the leading line. Return the coupon checked for the material you want.**

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Twenty pages of specifications covering new items in the constantly expanding line of Tube-Turn* welding fittings.

**2 WHY AND WHERE TO USE STAINLESS STEEL PIPING**
Interesting and informative, this 24-page booklet answers the question: "Why and Where Use Stainless Steel Piping?", and discusses applicable welding processes. Well illustrated.

**3 TUBE-TURN CATALOG AND ENGINEERING DATA BOOK No. 111**
The 240-page volume containing a wealth of engineering information and technical data, as well as buying information covering more than 4000 welding fittings and flanges.

**4 ALLOWABLE WORKING PRESSURES OF TUBE-TURN WELDING FITTINGS**
Booklet of pressure tables, covering welding fittings in all sizes, all weights and all regularly manufactured materials, for Power Piping, Oil Piping, Heating Piping, Gas Piping, Refrigeration Piping.

**5 FLANGE PRESSURE-TEMPERATURE RATINGS**
A booklet giving you the revised ratings adopted as a war measure to utilize the full strength of Flanges, Flanged Fittings, and Valves with dimensions according to ASA B16-1939.

*T. M. REG. U. S. PAT. OFF.

**6 CHART OF PIPE & FITTINGS MATERIALS**
A very helpful quick-reference chart covering ASTM and other specifications, Chemistry, Service Temperature Limits and Welding Data on carbon, intermediate alloy, stainless and special analysis steels

**7 TUBE-TURN STAINLESS STEEL WELDING FITTINGS AND FLANGES**
A book of technical data and buying information covering a wide range of styles and sizes of stainless steel welding fittings and flanges in types 304, 316, 347.

**8 FATIGUE TESTS OF WELDING ELBOWS AND COMPARABLE DOUBLE-MITRE BENDS**
A research paper presented before A.S.M.E. Analyzes effects of bending in the plane and bending transverse to the plane of curvature and bending with and without internal pressure.

**9 DIMENSIONAL DATA AND WEIGHTS**
A folder of man-size tables giving you dimensional information concerning Tube-Turn welding fittings from ½" to 30" in standard weight and extra strong, and flanges in all sizes and weights.

**10 VOLUMETRIC CAPACITIES OF TUBE-TURN WELDING FITTINGS**
A handy booklet giving capacities in cubic inches of Tube-Turn welding Elbows, Returns, Caps, Lap Joint Stub Ends, Crosses, Reducers, and Reducing Outlet Tees in their full range of sizes.

**11 TUBE-TURN GROOVE TYPE WELDING RINGS WITH KNOCK-OFF SPACER PINS**
A folder of data about a major new development for better pipe welding—a perfectly engineered welding ring that assures exact root gap spacing and complete penetration.

**TUBE TURNS, INC., DEPT. 10, LOUISVILLE 1, KY**

Please send Tube-Turn reference material indicated by the numbers I have checked below. I understand there is no obligation.

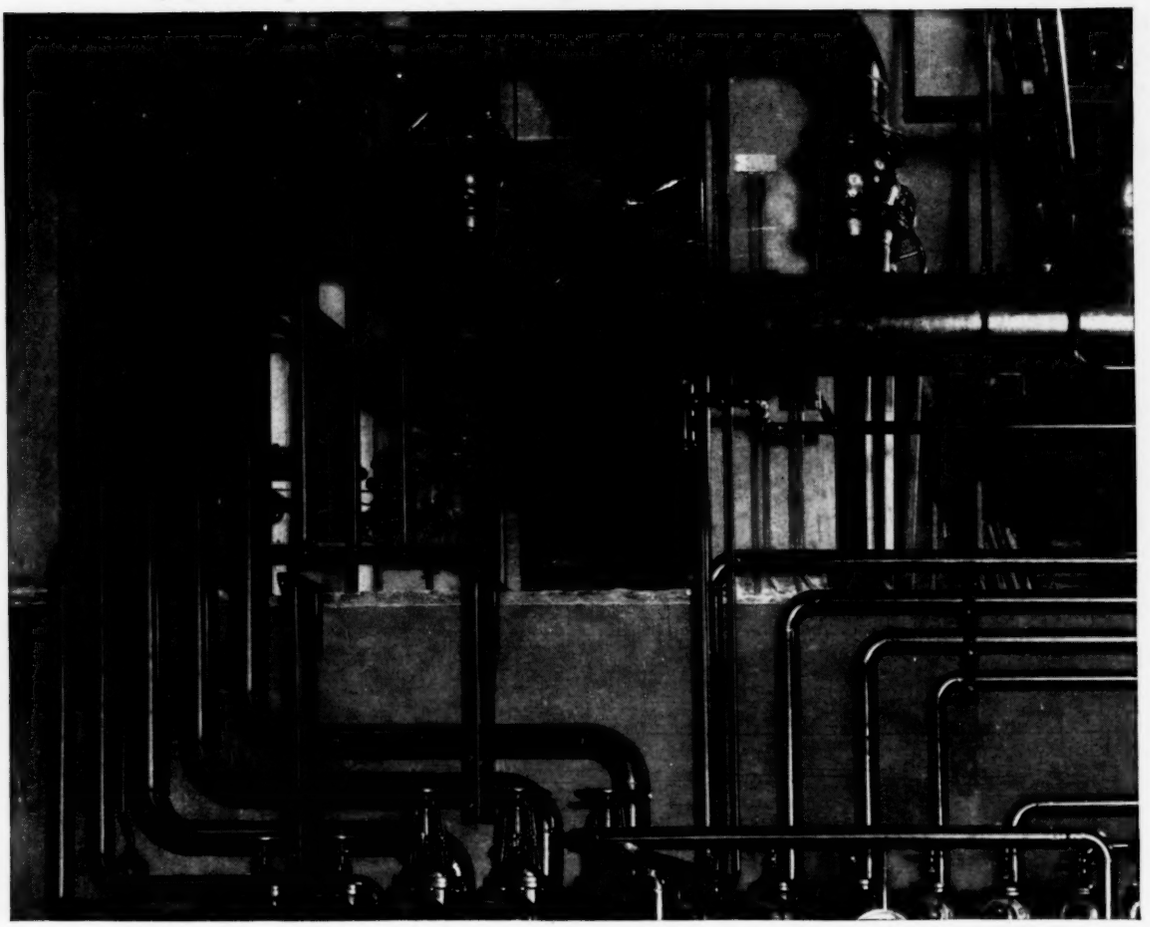
1 2 3 4 5 6 7 8 9 10 11

NAME_____

FIRM_____ Position

ADDRESS_____

CITY_____ ZONE____ STATE____



**Heating, Ventilating, Air Conditioning and Refrigeration** piping systems equipped with Tube-Turn seamless welding fittings are compact, weigh less, are easier to install, simple to insulate.

# *Piping Perfection for ALL Industry*

When Tube Turns, Inc. pioneered welding fittings, industry at large received a multi-million dollar boost in increased piping efficiency.

Tube-Turn welding fittings add superior, *forged-in* strength to any industrial piping system. Light in weight, and forming a continuous, leakproof connection with the pipe, Tube-Turn fittings are easy to install, simplify insulation. Absence of crevices and projections within joints reduces corrosion and erosion, also facilitates flow.

Backed by the nation's foremost welding fitting manufacturing experience, Tube-Turn welding fittings—*the fittings that become part of the pipe*—are quality-controlled for dependability, are readily available in the widest range of types, sizes, metals and alloys.

In addition to more than 4000 items in grade A and grade B carbon steels, Tube-Turn welding fittings and flanges are manufactured in wrought iron, copper, Monel metal, stainless steels, carbon moly steels, aluminum, brass, Inconel, nickel.

**TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY**

*District Offices at* New York, Philadelphia, Pittsburgh, Detroit, Chicago, Houston, Tulsa, San Francisco, Los Angeles

# TUBE-TURN

TRADE MARK REG. U. S. PAT. OFF.

## Welding Fittings and Flanges

SECRETARY OF INTERIOR ASKS PUBLIC TO CUT OIL AND GAS USE 15%
Warning Shortages May Last 3 Years
Home Owners To Keep Temperature To
Reduce A
OIL BURNER BUYING RISKY, PUBLIC WARNED
Sec'y of Interior Asking Price Freeze
Predicts Shortages for Years.
WASHINGTON, Jan. 14—The Secretary of the Interior today said home builders who install oil furnaces do so at their own risk under present oil supply conditions.
Oil Situation May Last 4 or
Gasoline Shortages May Affect Harvesting
New Cold Wave Due
Short o

# HOW ABOUT HEAT...

## is your building a "FUEL ORPHAN"?

• Many buildings have become "fuel orphans" in the past winter months due to the critical shortages of fuels other than coal.

Your tenants may be co-operating right now, but how about the future? Will tenants continue to put up with chilly quarters? The experts see no relief for as long as *5 years!*

There is plenty of anthracite. Hard coal stokers burning the smaller, cheaper sizes of hard coal, provide automatic heat with fuel savings often up to 50%. There is an automatic hard coal stoker to fit the needs of every building.

Anthracite cannot smoke under any condition of use and, therefore, can never violate a smoke ordinance. This clean hard coal stores without degradation or danger of spontaneous combustion.

For all the facts on heating with anthracite, send the coupon to us.

ANTHRACITE INSTITUTE

101 Park Avenue • New York 17, New York

**ANTHRACITE INSTITUTE**
Department 31
101 Park Avenue
New York 17, New York

Please send me complete information on anthracite and anthracite equipment.

Name_____

Company_____

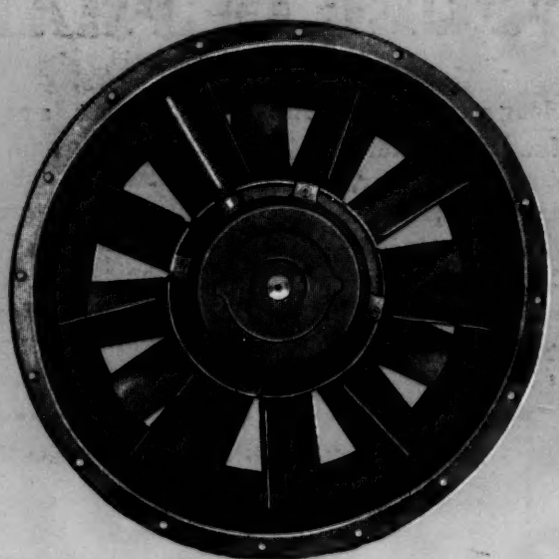
Address_____

City_____ Zone____ State_____

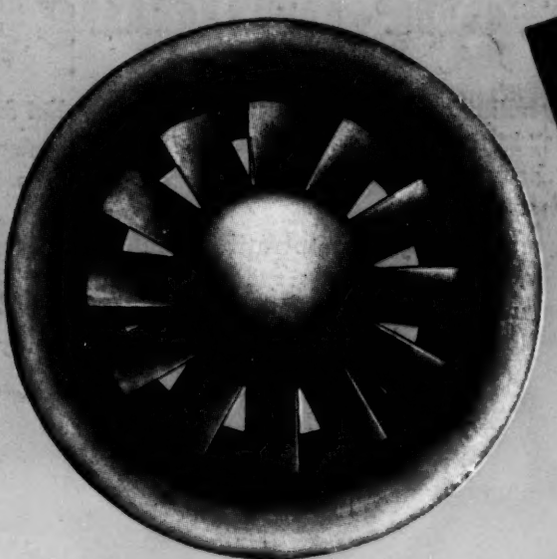
*The greatest advance in Fan Engineering in a decade!*

# JOY "SERIES 1000" *AXIVANE FANS*

**Utilizing the Vaneaxial principle— permitting high efficiences, low installation costs and many other outstanding advantages to the user.**



**Rear view, showing vanes and motor.**



**Front view, showing simplicity of construction.**

*Call for a Joy Engineer*

# JOY FANS

## *Joy Axivane Fans offer exclusively the obvious advantages of "on-the-job" blade adjustment–*

**Adjustable Blades, insures maximum performance efficiency and flexibility. Blades are adjustable on-the-job by loosening just one lock nut, enabling correction of duct resistance and providing wide pressure ranges.**

**TROLLER DESIGNED**

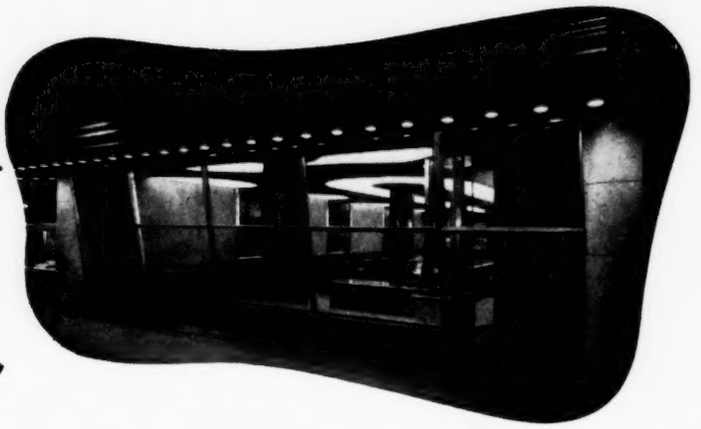
**Sectional drawing showing compact, easily installed, easily applied design.**

*Write for descriptive Bulletin illustrating various general industrial applications. Now ready!*

W&D I-1487

# JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.



# Super-clean air

## served with every meal

*Clark's Restaurant, South Bend, Ind., features modern air conditioning system equipped with AAF Electro-Matic Electronic Precipitator.*

THIS new restaurant of Clark's Lunch Room, Inc., South Bend, Ind., is modern from the entrance way right back to the all-electric kitchens. And out of sight, but always on the job, is an AAF Electro-Matic* Electronic Precipitator which delivers air to match the quality of their service.

Soot, dust and smoke can soon make the smartest interiors look dull and shoddy—defeat the most careful efforts to serve clean, appetizing food. There's the problem of tobacco smoke, too. Multiply the output of one after-dinner cigarette by a hundred and you have a threat to customer comfort. The AAF Electro-Matic removes this as well as incoming smoke and permits the air conditioning system to function properly with the correct ratio of recirculated and outdoor air.

Clean air is not a luxury but a sound investment measured in actual dollar savings that are attractive to the small and large businesses alike. And the recommendation of AAF Electronic Precipitators to your clients will assure them maximum benefits.

There's an American Air Filter of a type and capacity to solve every air cleaning problem. Complete catalog data may be obtained from your local AAF Representative or by writing direct to—

** Automatic Electronic Precipitator*

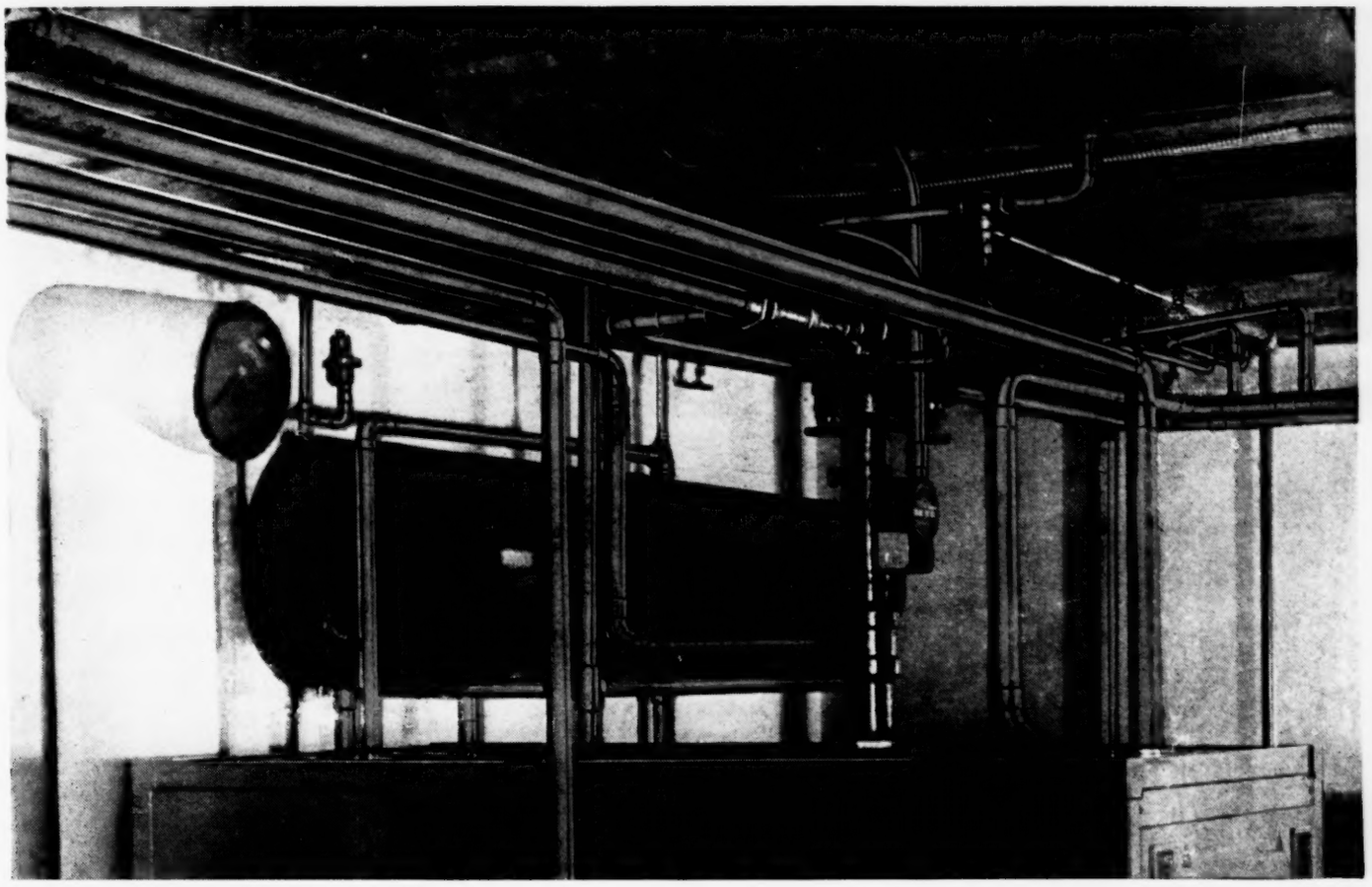
# AMERICAN AIR FILTER COMPANY, INC.

**294 Central Avenue, Louisville 8, Ky.**

*In Canada: Darling Bros., Ltd., Montreal, P. Q.*

AAF

**AIR FILTERS**
AND DUST CONTROL EQUIPMENT



# THROUGH THE YEARS...

# *Copper costs less*

IN COMMERCIAL BUILDINGS, industrial plants and in homes large and small, pipelines cost less *by the year* when they're copper.

The installed cost of a copper tube system very often approximates that of ordinary piping. This is because installation may be expedited with solder-type fittings. Because soft annealed copper tube is available in long lengths, and may be bent around obstructions, fewer fittings are required. Because threading is eliminated and no allowance need be made for rust-clogging, copper tubes may be of relatively smaller diameter and lighter weight.

Anaconda Copper Tubes are made from specially deoxidized 99.9+% pure copper, furnished soft in 60-foot coils, also hard and soft in 20-foot straight lengths. Types K and L Tubes, trade-marked "Anaconda," are available from wholesale distributors throughout the country.

Publications B-1 and C-2 discuss copper tubes for general plumbing, and for heating lines, respectively. Publication C-24 covers industrial applications. Copies will be mailed on request.

4715 Rev. 2

ANACONDA
from mine to consumer

*Anaconda*

**COPPER WATER TUBES**

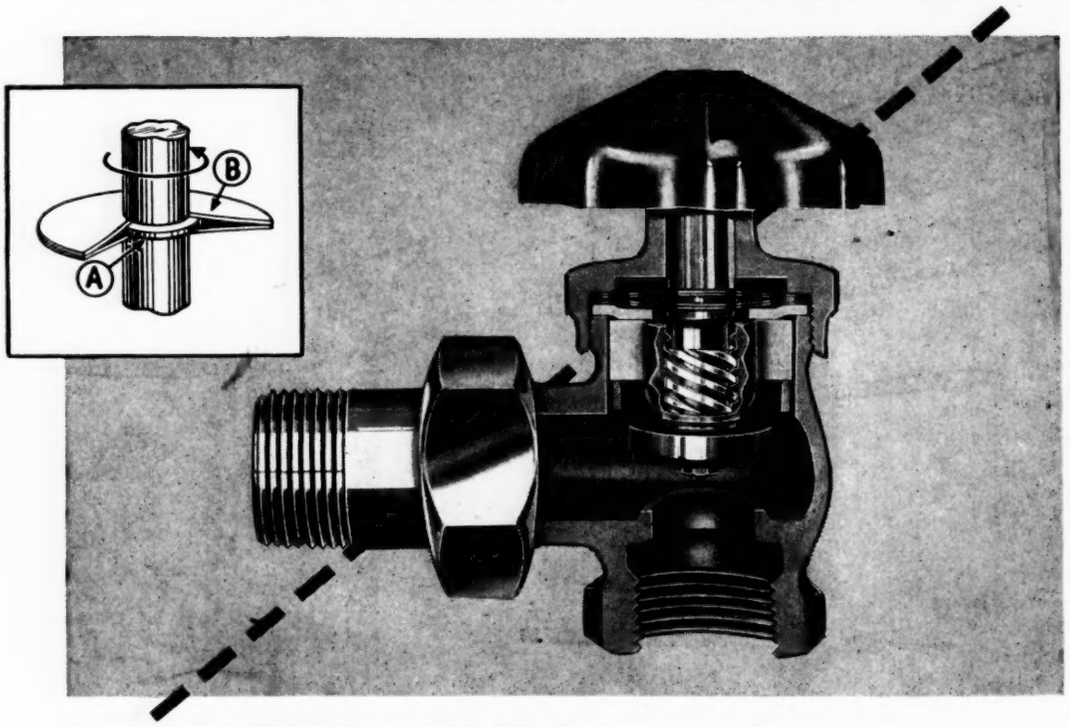
**THE AMERICAN BRASS COMPANY**

General Offices: Waterbury 88, Connecticut

*Subsidiary of Anaconda Copper Mining Company*

*In Canada:* ANACONDA AMERICAN BRASS LTD.
*New Toronto, Ont.*

# A Valve that is




# PACKLESS in fact

## . . . *not just packless in name*

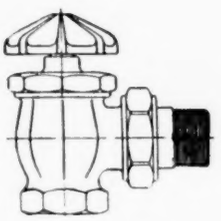
When the job calls for the kind of valve that will stand up across the years —when it calls for a valve that is packless in the full meaning of the word— then, no matter how far you look, you'll find in the Marsh Packless the only valve that completely fills the bill.

In fact, many users consider this the only valve that is packless in fact as well as in name, and they have a good reason for this. There is a difference between pack less and packless! The diagram tells the story of Marsh truly packless construction. A collar (A) is machined on the valve stem. The stainless spring steel wafers (B) press against this collar to form a tight annular seal This, you see, is a metal-to-metal seal—*permanently* leakproof.

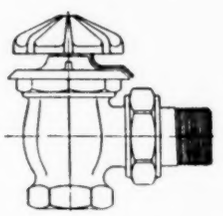
And this better construction is typical of the quality and refinement found throughout the Marsh Packless Valve—in the swivel, self-seating, self-cleaning disc—in the excellent proportioning, machining, workmanship and finish.

Packed valves can and do "blow out", scalding or burning the operator. This danger is avoided when you use the Marsh Packless. It is a valve you can rely on for any service up to 100 lbs. Furnished in a wide range of patterns including graduated and extended stem types, the Marsh Packless Valve is widely used for steam and hot water heating systems, coffee urns, steam kettles, sterilizers, ovens and similar services. Ask our representative or engineering department for facts.

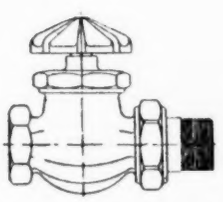
**MARSH HEATING EQUIPMENT CO.**
*Division of*
**JAS. P. MARSH CORPORATION,** (Dept. U), SKOKIE, ILLINOIS



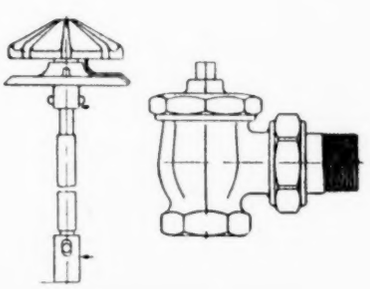
**Wheel Angle**



**Wheel Angle Graduated**



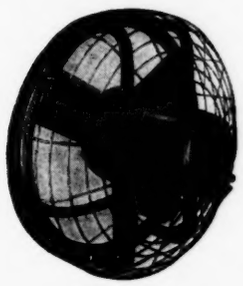
**Globe**



**Extension stem**

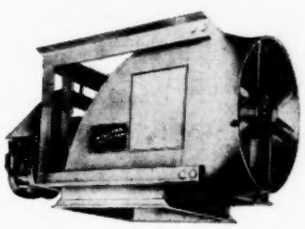
**MARSH** SINCE 1865
*Quality Heating Specialties*

# WING VENTILATING EQUIPMENT



## WINGFOIL SAFETY VENTILATING FAN

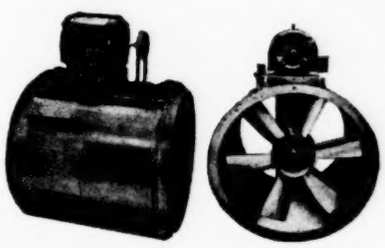
Distinguished for efficiency and rugged construction. The new Wingfoil fan wheel moves maximum volumes of air with minimum horsepower, due largely to its non-overloading features. Sizes from 10" to 60" dia., with free air capacities from 860 to 58,000 CFM. Larger sizes on special order. Either direct or belt drive. Heavy steel guards provide safety.



## WINGFOIL DUCT FAN

**(Elbow Type)**

Designed to form an elbow in the duct system, the elbow-shaped housing in a strong rectangular frame permits installation with the inlet in any desired position. Motor and drive are outside the air stream, therefore remain cool, clean, and easily accessible. The new Wingfoil Fan has a remarkable "non-overloading" characteristic. Sizes 10" to 60"; capacities up to 60,000 CFM.



## WINGFOIL DUCT FAN

**(Straight Line Type)**

Designed to form a part of any straight run of duct. The motor is mounted on an adjustable base outside of the housing. V-belt drive is through an air tube carried across the housing and supporting fan shaft and bearings. Fan wheel is the new, non-overloading Wingfoil Fan. Bearings are grease-sealed, requiring minimum of attention.

*WRITE FOR BULLETINS*

**Slowly revolving outlets distribute the heated air continuously downward in a constantly changing direction, completely and thoroughly covering the working area**

*Write for details*

# L. J. Wing Mfg. Co.

**154 W. 14th Street**
**New York 11, N. Y.**

***Factories: Newark, N. J. and Montreal, Canada***

question:

## WHAT OIL BURNER LINE . . .
### for replacing today's worn-out burners and fuel-wasting furnaces and boilers?

answer:

TODAY — when fuel oil conservation is a must — you are well aware of the growing demand for modern, efficient oil burners to replace worn-out fuel-wasters with which so many homeowners are now struggling. So, in choosing a line of oil-fired equipment, you must be sure *above all* that the burner you select *can* and *does* give most heat with least fuel.

That means Petro, the oil burner of *proven* fuel-conserving ability. Now, more than ever before, your customers will appreciate such basic design features as Petro's patented oil-saving nozzle — that utilizes "tubular atomization" to make every drop of fuel oil deliver maximum heat. Made by the world's largest, oldest exclusive manufacturer of oil burning equipment, the Petro line incorporates 45 years' specialized oil heating experience.

You'll profit with Petro under today's conditions — and tomorrow's as well. Established heating and plumbing jobbers in all wholesale trading areas can give you further details on Petro oil burners, boiler-burner units, furnace-burner units, water heaters. Investigate now!

**PETRO**
REG U S PAT OFF

**OIL BURNERS • BOILER-BURNER UNITS**
**FURNACE-BURNER UNITS • WATER HEATERS**

**PETROLEUM HEAT AND POWER COMPANY • Stamford, Connecticut**
*Makers of Good Oil Burning Equipment Since 1903*
REFINERIES . . . FUEL OIL STORAGE AND DISTRIBUTION TERMINALS
NATIONWIDE OIL BURNER SALES AND SERVICE FACILITIES

**WESTERN STATES DISTRIBUTORS:** Combustion Utilities, Inc., San Francisco, California; Sullivan Valve and Engineering Company, Butte, Montana; Lawson Supply Company and Pace Turpin Company, Salt Lake City, Utah.

*Announcing The New*

# HERMAN NELSON UNIT VENTILATOR

**The first post-war contribution to better schoolroom health and comfort**

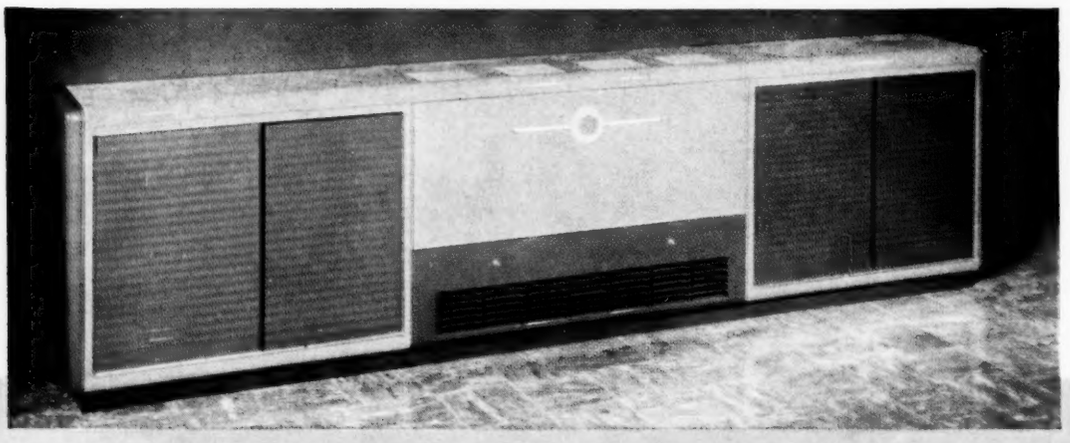
***The first post-war contribution*** to better schoolroom health and comfort has been incorporated in the new Herman Nelson Unit Ventilator. Knowing that the biggest obstacle to perfect control of unit ventilators was the inability to gradually throttle the steam supply to the heating element and at the same time distribute the steam uniformly throughout the heating element, Herman Nelson research engineers devised a pressure equalizing unit to solve this problem. By bleeding air into the heating element from the return line this unit permits maintenance of an equal pressure when the steam supply is throttled. Together with other Herman Nelson features of design and construction, this development assures maintenance of healthful and comfortable air conditions in the school classroom.

## *The new* Herman Nelson Unit Ventilator

# 9 IMPORTANT POINTS OF SUPERIORITY

## contributing to better schoolroom health and comfort

1. **SLOW SPEED, DIRECT CONNECTED MOTOR** contributes to quiet operation and assures long, dependable service. Location of motor in end compartment permits use of entire cabinet space for fans and allows them to be placed above heating element. Control unit easily reached through access grille.
2. **MODULAR FAN UNITS** assure uniform tip speeds and outlet velocities on all sizes of units. Occupying entire cabinet space, fans are large and quiet. Location of the fans at outlet of unit permits uniform temperature of air introduced into room from each outlet.
3. **FLOATING HEATING ELEMENT,** with one end of each tube riding free, cannot be damaged by expansion and contraction. Internal steam distributing tubes assure uniform distribution of steam within heating element. Location in lower section of cabinet permits convection of heat with fans not running.
4. **PRESSURE EQUALIZING UNIT** between heating element and return line allows gradual throttling of steam supply. It permits maintenance of an equal pressure when the steam supply is throttled by bleeding air into the heating element from the return line. A special device designed into this unit prevents by-passing of steam.
5. **CONDENSATE COOLING SURFACE** prevents flooding of heating element. This extended surface, located in the air stream, permits the trap to function properly so that condensate does not back up in the heating element, preventing even distribution of steam and causing water-hammer.
6. **WELDED CABINET CONSTRUCTION** assures modern, structural strength. Front panels and ends are easily removed for full access to all parts during installation. Only a small, easily handled front panel need be removed for changing filter. Directional flow discharge grilles provide proper distribution of air throughout room.
7. **AUTOMATIC BACK DRAFT DAMPER** prevents cold air from passing through room air grille. It is held open when unit is not in operation to permit convection of heat. Outdoor air damper is perfectly balanced and of light weight construction, requiring little power for operation.
8. **DEMOUNTABLE WALL INTAKE** permits an absolutely weather-tight installation. Louver assembly can be removed from the intake frame which is set in the wall. Intake opening is then accessible for caulking wall opening.
9. **INTEGRAL DESIGN OF CABINET** permits the unit ventilator to be used by itself or as a section of a group including utility cabinets and convectors. Utility cabinets can be added at any future date. Any combination of units is always finished on the ends so that it is not necessary to line the entire wall with shelving.



*New Herman Nelson Unit Ventilator with Utility Cabinets. Illustration shows how Cabinets or Convectors and Ventilator become one integral unit. Additional cabinets may be added at any time desired.*

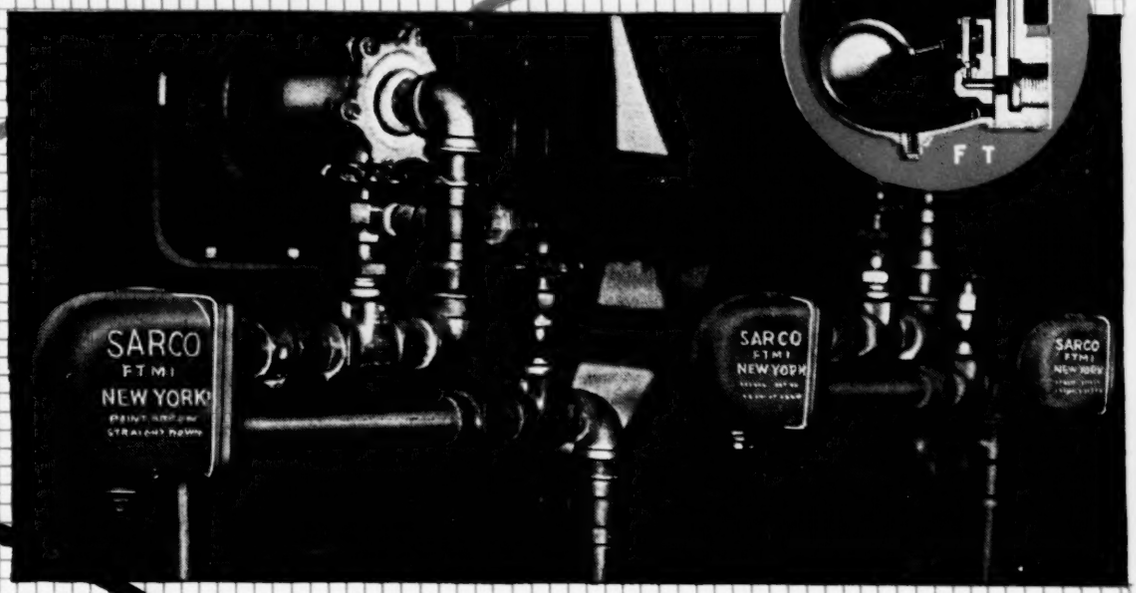
herman nelson moline illinois

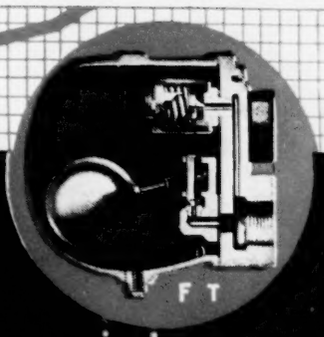
# THE HERMAN NELSON CORPORATION

***Since 1906 Manufacturers of Quality Heating and Ventilating Products***

**MOLINE, ILLINOIS**

# KEEPING HEAT UP -



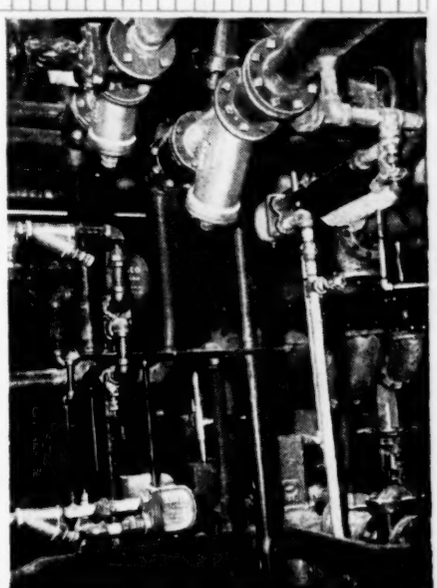

## - and Costs Down

The top illustration shows the Sarco Float-Thermostatic Steam Trap on slashers in a textile mill—now operating satisfactorily after many months of condensate difficulties. The same story has been told and retold by users of similar machines in the paper and dyeing industries.

At the right is a section of a new and very modern rug mill which chose the reliability of Sarco FT traps and Strainers for its extensive air conditioning hook-ups because the engineers had seen their worth proven on other jobs for many years.

In the dyeing, chemical and food industries, four entirely different types of Sarco Steam Traps are combined with various forms of Sarco heating and cooling controls to provide efficient team work that can't be beaten.

Even on unit heaters, radiators and steam lines it is important to select the right steam trap or control. The Sarco representative near you will be glad to study, select and recommend the combination that will speed production and reduce fuel costs in your plant.



SARCO STRAINER

165

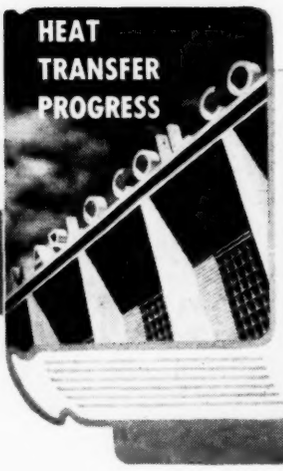
SARCO SAVES STEAM

**SARCO COMPANY, INC.**

*Represented in Principal Cities*

**Empire State Building, New York 1, N. Y.**

SARCO CANADA, LTD., TORONTO 5, ONTARIO




CHAPTER ONE

# We split hairs

## to give you *more* for your heat transfer dollar

**1/10,000 OF AN INCH**—a fraction of a hair's breadth... is the tolerance we maintain in our new precision machine shop, where we make our own tools and dies.

Yes, we're sticklers for details... because they all add up to better value for you. Making our own tools and dies to the highest standards of accuracy is the first step in our modern "assembly line" production system.

**RESULT:**

- **Interchangeable parts**—for easy replacement in the field.
- **Uniform performance**—every unit equally dependable.
- **More efficient production**—which means we can build more quality and value, dollar for dollar, into every Marlo product.

**Marlo IS THE MARK OF HEAT TRANSFER PROGRESS**

MARLO = HEAT TRANSFER
Since 1935

**MARLO COIL CO. / ST. LOUIS 10, MO.**

# *Proved and Improved*

## LOW PRESSURE GAS REGULATORS

**V-300**

**HIGH CAPACITY • CLOSE REGULATION • NOMINAL COST**

V-300 Series Regulators are scientifically designed to resist corrosion from all types of fuel gases and are precision-built with the finest materials to insure continuous and efficient appliance operation.

They control the flow of natural, manufactured and liquefied petroleum gases. Widely used for space, range and water heaters, core and baking ovens, fryers, dryers, and other gas-fired applications in homes and industry. Sizes up to and including 1¼" I.P.S. available. For larger sizes, contact factory.

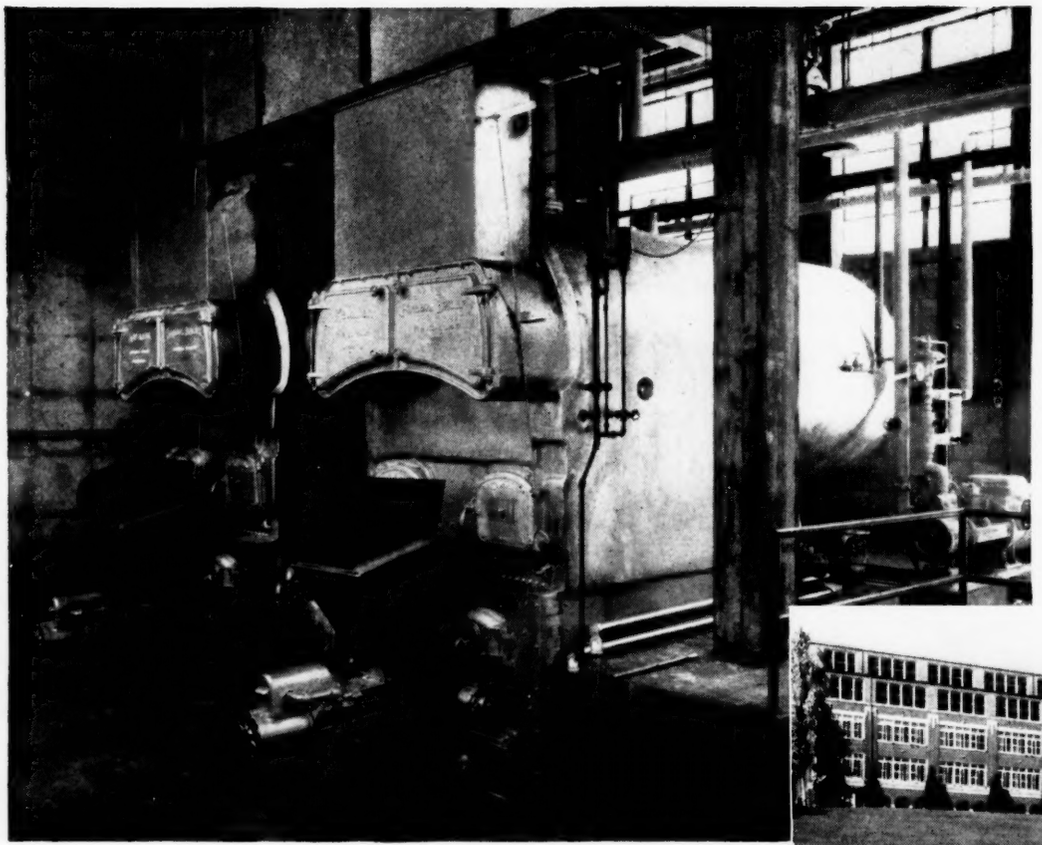
*For complete specifications on gas regulators, fuel governors, control and safety valves and thermostats for the gas industry, write for new catalog 52C.*

**GENERAL CONTROLS**

**801 ALLEN AVENUE GLENDALE 1, CALIF.**

*Manufacturers of Automatic, Pressure, Temperature & Flow Controls*

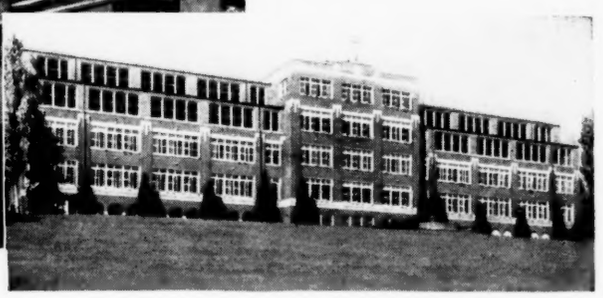
**FACTORY BRANCHES:** PHILADELPHIA • ATLANTA • BOSTON • CHICAGO • DALLAS
KANSAS CITY • NEW YORK • DENVER • DETROIT • CLEVELAND • PITTSBURGH
40-1 HOUSTON • SEATTLE • SAN FRANCISCO • **DISTRIBUTORS IN PRINCIPAL CITIES**



**In LAKE VIEW SANATORIUM**
**Mendota, Dane County, Wis.**

Pair of Stoker Fired KEWANEE Heavy Duty Boilers for 50,000 square feet of steam radiation . . .

To have plenty in reserve for unusual demands is characteristic of Kewanee.



**STOKER FIRED**

# KEWANEE

## HEAVY DUTY BOILERS

**In every Kewanee there are *extra values* which mean longer life and lower fuel bills.**

Built extra well of *extra* stout steel. There is also *extra* sturdiness and *extra* fine finish in all castings so doors and frames fit tight.

There is *extra room and height* in the fireboxes to burn the fuel completely and *extra long* gas travel to extract all the usable heat. Extra wide waterways insure rapid circulation and steaming without turbulence. *Extra* steam space and height to take care of sudden emergencies with plenty of extra dry steam.

For Power, Process Steam or Heating the Kewanee Heavy Duty Series is built in sizes for 10 to 304 horsepower with mechanical or hand firing at 100, 125 or 150 working steam pressure.

SBI

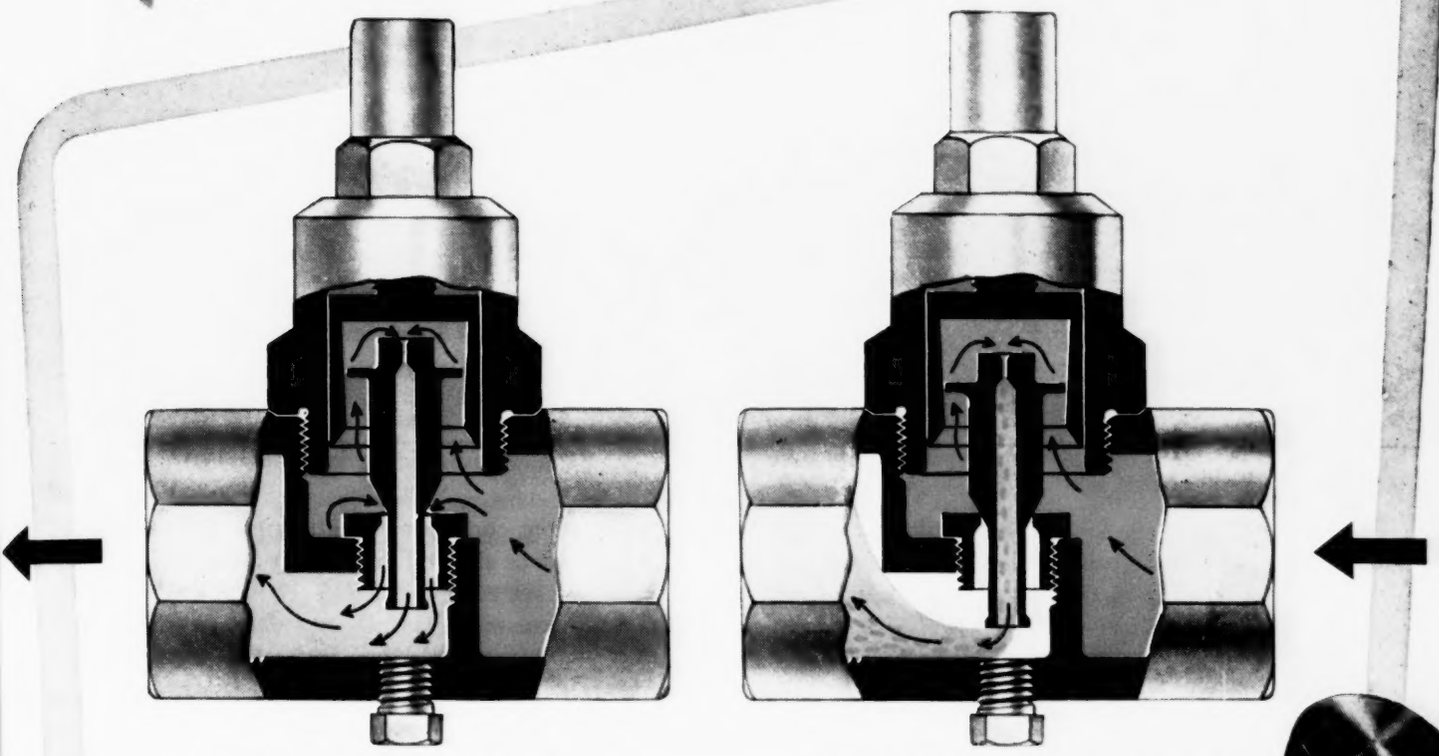
Reg. U. S. Pat. Off.
MEMBER

**KEWANEE BOILER CORPORATION**
**KEWANEE, ILLINOIS**
**Branches in 60 Cities—Eastern District Office: 40 West 40th Street, New York City 18**
Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

OVER 75 YEARS BOILERMAKERS

# WHY YARWAYS GET EQUIPMENT

## *Hotter, Sooner*



*VALVE OPEN—Main flow through seat.*

*VALVE CLOSED—Main flow shut off.*

There's a basic reason why the Yarway Impulse Steam Trap gets equipment hotter, sooner . . . and *keeps it hot.* It's this . . . As soon as steam is turned on, the Yarway trap opens wide and discharges air and condensate continuously until the system is cleared. Equipment is brought to working temperature in the shortest possible time.

Once working temperature is reached, Yarways discharge intermittently to *keep* equipment at peak performance. Under very light condensate loads, discharge is small and continuous through control orifice, and main valve does not lift. *There is no wasteful steam leak,* since a mere 3% of full condensate capacity keeps control orifice completely sealed against discharge of live steam.

No wonder more than 525,000 Yarways have already been sold. They not only speed production . . . but also produce substantial operating economies.

Other Yarway advantages—*small size, easy maintenance, low price.* For full description and operating details of the Yarway Impulse Steam Trap write for Bulletin T-1739.

Try some Yarways today. See your nearby Mill Supply Dealer.

Yarway color and sound motion picture, "There Is An Engineering Reason". Available without charge for group showings. Write today.

**YARNALL-WARING COMPANY, 104 Mermaid Ave., Phila. 18, Pa.**

Yarway Impulse Steam Traps are now made and sold in Canada and Great Britain

**YARWAY IMPULSE STEAM TRAP**

# Bertha... "THE SEWING MACHINE GIRL" is really cozy now !

How to keep 25,000 square feet of unbroken floor area warm enough that women's fingers could keep pace with high speed sewing machines, even on coldest days? Mr. M. M. Barry, manager of the Connellsville Sportswear Company, a garment manufacturing plant in Connellsville, Pennsylvania, had this seemingly expensive heating problem to solve.

Mr. Barry found a simple, low-cost solution by providing heat directly at working level with Dravo *Counterflo* Heaters. Four heaters, one on each wall, blanket the factory working area with a draft-free "cross-fire" of warm air above the heads of the workers. Heat distribution is uniform at 72 to 75 degrees throughout.

Completely automatic, the Dravo *Counterflo* Heaters require only a fuel line, power line and short vent stack—no boiler room construction—allowing the thermostat to be lowered or shut off completely at night for additional important economies.

Dravo heaters produce warm air quickly. Sturdy, carefully engineered construction, plus a stainless steel combustion chamber, minimize maintenance cost. Equally efficient with oil or gas, sizes ranging from 400,000 to 2,000,000 BTU per hour output are available. A touch of the selector switch converts them immediately to high-capacity air-circulating units for summer use.

If you would like more information to help solve your own heating problems, write for Bulletin GV-516, Heating Section, Dravo Corporation, Dravo Building, Pittsburgh 22, Pennsylvania.

Living room comfort speeds production and cuts absenteeism in this modern garment manufacturing plant. As the manager, Mr. Barry says, "Women employees cannot be expected to operate sewing machines properly if their hands and feet are cold or if they are otherwise uncomfortable."

Dravo also manufactures the DRAVO CRANE CAB COOLER for air conditioning hot-metal crane cabs.

**DRAVO CORPORATION**

*Sales Representatives in Principal Cities*

DRAVO

PITTSBURGH · CLEVELAND
PHILADELPHIA · DETROIT
NEW YORK · CHICAGO
ATLANTA · BOSTON

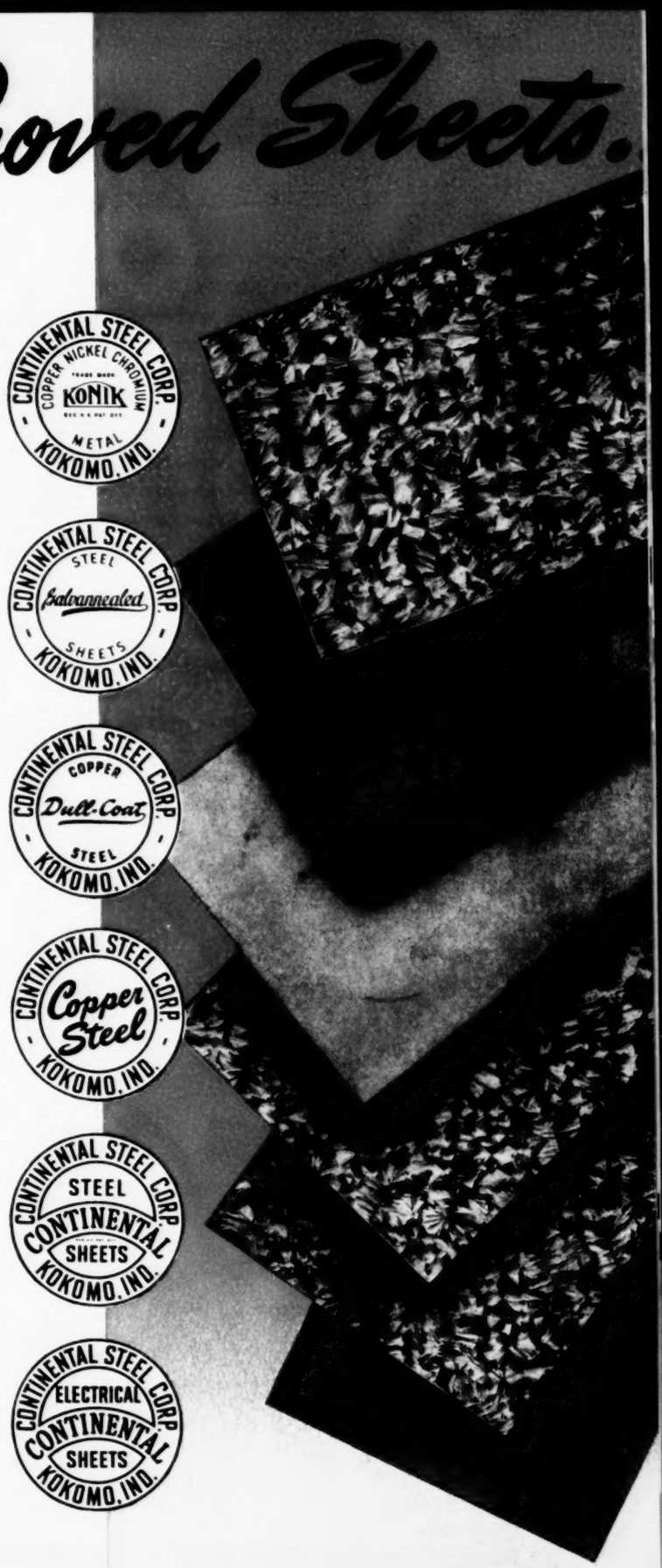
# Product-Proved Sheets.

## PREFERRED BY MANUFACTURERS AND FABRICATORS

Manufacturers and fabricators who insist on steel sheets that combine workability with proved quality have found in the Continental line just the *right* sheet for each specific requirement.

The ability of the various types of Continental sheets to withstand difficult forming operations . . . to provide longer product life . . . proves the importance of using one of these familiar trademarked Continental sheets.

These are the sheets preferred by many companies for their highest quality products: Continental KONIK, a sheet which combines open hearth steel with copper, nickel and chromium to produce one of the finest, most economical sheets you can buy; Continental GALVANNEALED, a special quality sheet possessing a matte-like surface which "takes" and "holds" paint and fine finishes without the need of costly preparatory treatments; Continental DULL-COAT, another sheet with a zinc coating which provides a tight bond for paints, enamels and lacquers; Continental COPPER STEEL sheets, noted for their extra resistance to rust and corrosion, and for their workability; Continental GALVANIZED, a sheet with a zinc coating that withstands difficult forming operations without flaking or peeling; and Continental ELECTRICAL sheets which are made especially for manufacturers of electrical equipment. Write for special descriptive folder.


CONTINENTAL STEEL CORP. COPPER NICKEL CHROMIUM KONIK METAL KOKOMO, IND.
CONTINENTAL STEEL CORP. STEEL Galvannealed SHEETS KOKOMO, IND.
CONTINENTAL STEEL CORP. COPPER Dull-Coat STEEL KOKOMO, IND.
CONTINENTAL STEEL CORP. Copper Steel KOKOMO, IND.
CONTINENTAL STEEL CORP. STEEL CONTINENTAL SHEETS KOKOMO, IND.
CONTINENTAL STEEL CORP. ELECTRICAL CONTINENTAL SHEETS KOKOMO, IND.

# CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO INDIANA

**PRODUCERS OF STEEL SHEETS,** including Continental GALVANIZED, COPPER-STEEL Galvanized, KONIK steel sheets Galvanized, UNIFORM SPANGLE Galvanized, DULL COAT, Continental GALVANNEALED, ELECTRICAL, Hot Rolled Pickled, and many styles of Formed Roofing.

**ALSO,** Manufacturer's Wire in many sizes, shapes, tempers, and finishes, Continental Chain Link Fence, Nails, and other steel products.

# No worry about "weak links" when all piping is Crane

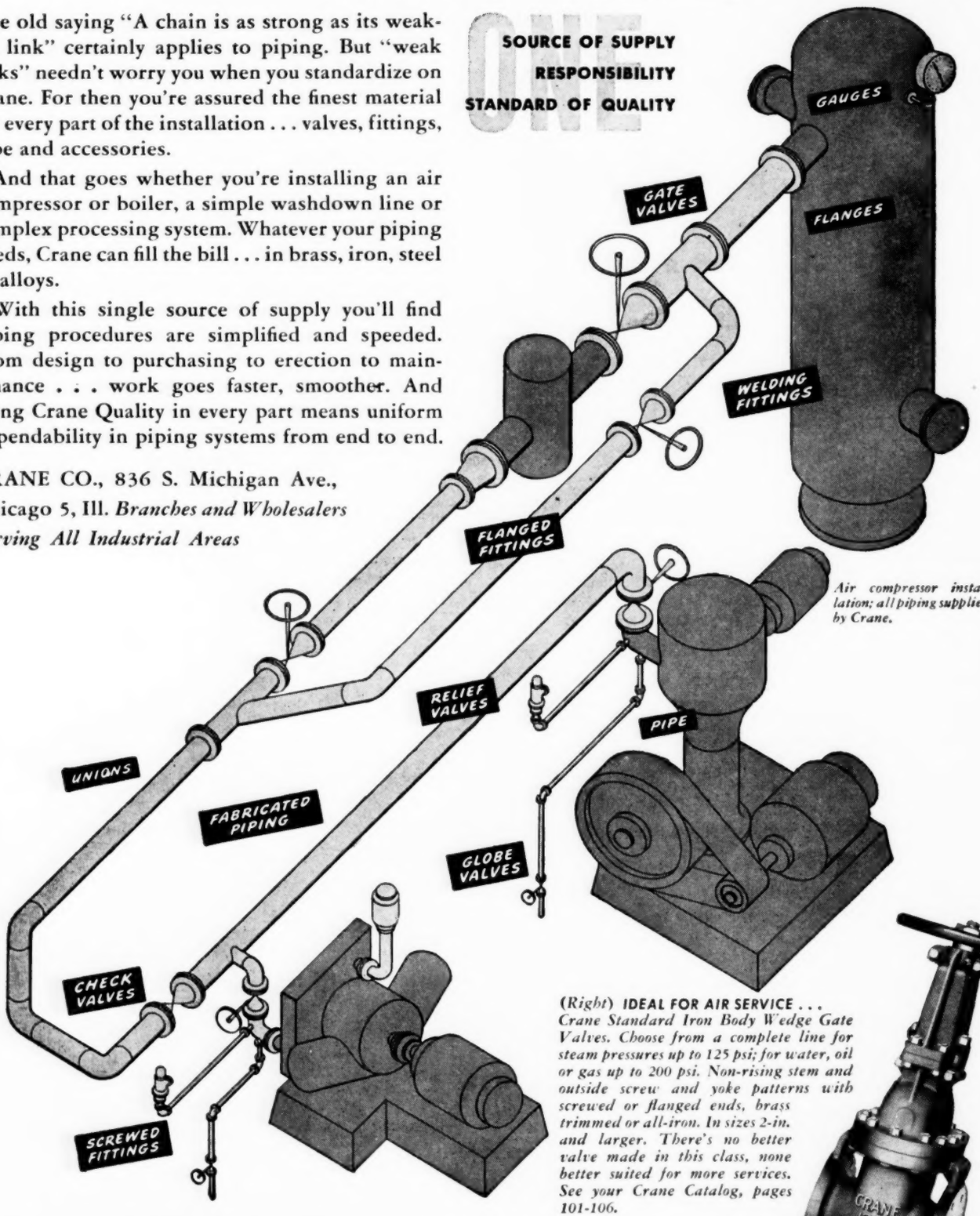
The old saying "A chain is as strong as its weakest link" certainly applies to piping. But "weak links" needn't worry you when you standardize on Crane. For then you're assured the finest material for every part of the installation . . . valves, fittings, pipe and accessories.

And that goes whether you're installing an air compressor or boiler, a simple washdown line or complex processing system. Whatever your piping needs, Crane can fill the bill . . . in brass, iron, steel or alloys.

With this single source of supply you'll find piping procedures are simplified and speeded. From design to purchasing to erection to maintenance . . . work goes faster, smoother. And using Crane Quality in every part means uniform dependability in piping systems from end to end.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill. *Branches and Wholesalers Serving All Industrial Areas*

**ONE**
**SOURCE OF SUPPLY**
**RESPONSIBILITY**
**STANDARD OF QUALITY**




*Air compressor installation; all piping supplied by Crane.*

(*Right*) **IDEAL FOR AIR SERVICE . . .** *Crane Standard Iron Body Wedge Gate Valves. Choose from a complete line for steam pressures up to 125 psi; for water, oil or gas up to 200 psi. Non-rising stem and outside screw and yoke patterns with screwed or flanged ends, brass trimmed or all-iron. In sizes 2-in. and larger. There's no better valve made in this class, none better suited for more services. See your Crane Catalog, pages 101-106.*

**EVERYTHING FROM . . .**

**VALVES . FITTINGS**
**PIPE . PLUMBING**
**AND HEATING**

# CRANE

**FOR EVERY PIPING SYSTEM**

# TRANE

## presents 8 pages of AIR CONDITIONING systems

**Designed to Specifications from the Industry's Greatest Line of Heating, Ventilating, and Air Conditioning Products**

## ENGINEERED AIR CONDITIONING

Good air conditioning *exactly* fits the needs of the application. That calls for a made-to-measure installation, which ordinarily is expensive. But the Trane way gives you all the advantages of *engineered* air conditioning at mass production prices.

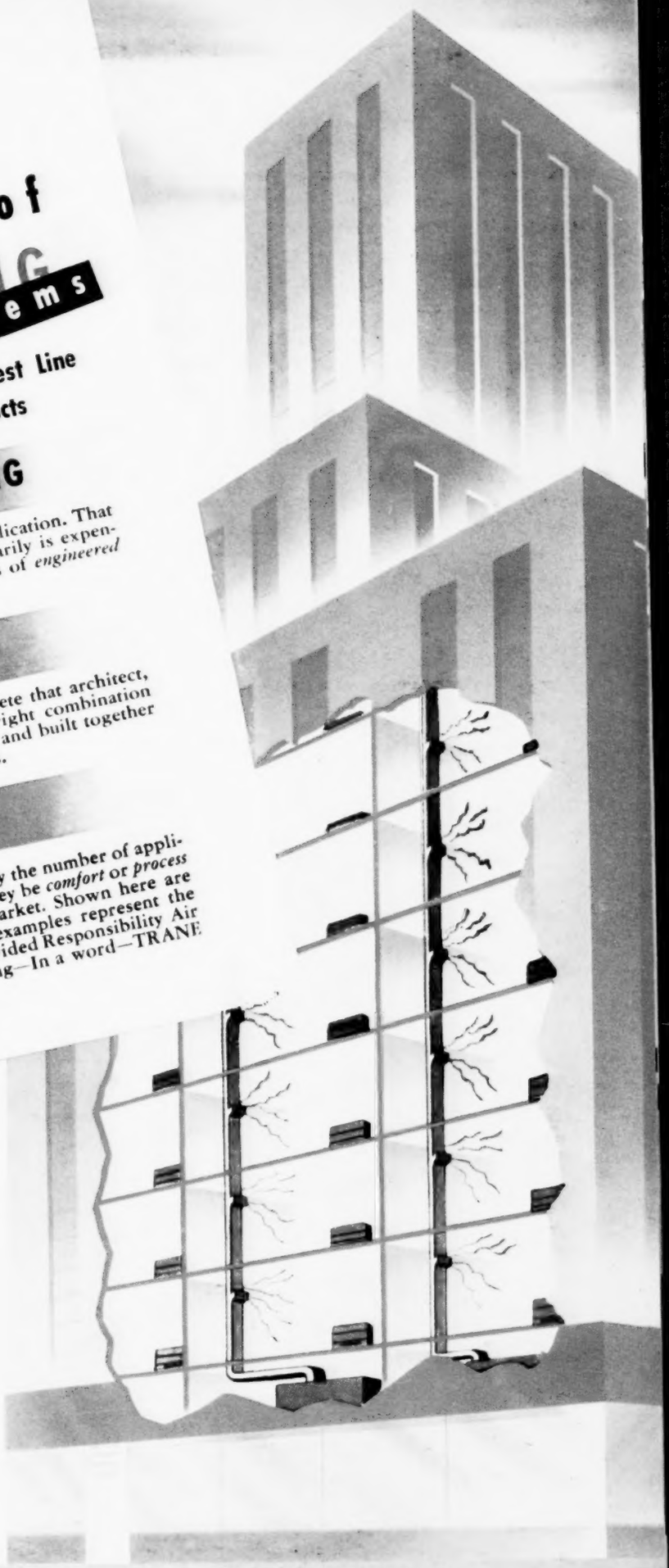
## THE TRANE WAY

Trane has developed a line of products so complete that architect, engineer and contractor can select exactly the right combination for the application. Trane products are designed and built together for use together, for perfectly integrated systems.

## TRANE SYSTEMS

The *number* of Trane Systems is limited only by the number of applications requiring air conditioning, whether they be *comfort* or *process* —in industry, commerce, or the domestic market. Shown here are samples of common combinations. These examples represent the best in Engineered Air Conditioning—Undivided Responsibility Air Conditioning—Economical Air Conditioning—In a word—TRANE Air Conditioning.

This page shows the multi-featured Trane Custom-Air Conditioning System for large buildings, along with one of the room units it uses. Details on pages following.



# TRANE

*The House of Weather Magic*

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# TRANE AIR CONDITIONING for systems

## Systems for Hotels, Apartments, Office Buildings and Institutions

### DIVERSIFIED REQUIREMENTS

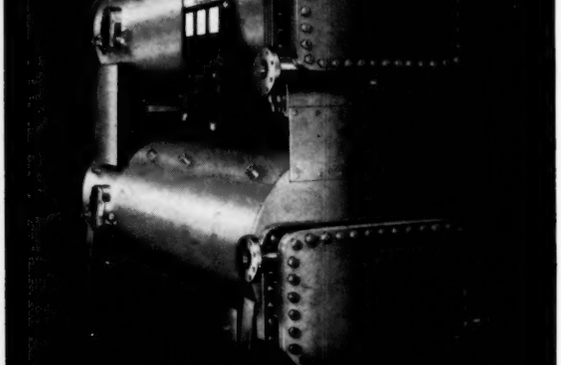
Large buildings, because of their varied requirements, often cannot be properly air conditioned by any one type of system. Because Trane has products for all types of systems, it is simple to engineer a combination system which will meet all requirements.

### LARGE, OPEN SPACES

For main dining rooms, ball rooms, and other large open spaces, a central system is frequently desirable. This indicates the use of such products as Trane fans, Trane heating and cooling coils, Trane compressors and auxiliary items.

### SMALL AREAS

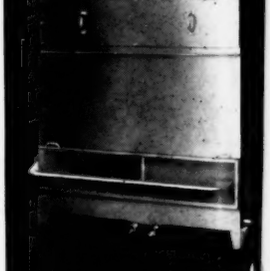
Since central systems do not permit the control flexibility required for smaller spaces, individual units for rooms, or zone type units for groups of rooms are indicated. Where a number of these areas are near each other, the use of Trane Climate Changers is standard practice. Where there are only a few such spaces, or where the spaces are widely separated, Trane Self-Contained Air Conditioners may be most economical.



### For CHILLING WATER in QUANTITY

**Trane Turbo-Vacuum Compressors** provide capacities from 70 tons upward for the efficient chilling of large quantities of water. All equipment room elements are combined in one compact unit. Quiet and free from vibration, units need no special footings, may be located wherever convenient, even to placing on upper floors. Centrifugal operation, hermetic design reduce wear and eliminate shaft seals.

### To SAVE REFRIGERATION WATER



**Trane Evaporative Condensers** cut refrigeration water costs by as much as 90%. Compact units, usable indoors or out, combine best features of cooling tower, air-cooled condenser, and water-cooled condenser. Units recirculate spray water over a cooling coil; use only enough water to replace evaporation loss. Economical to install.

# TRANE

*The Most Complete*

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# LARGE BUILDINGS....

## the TRANE CUSTOM-AIR SYSTEM

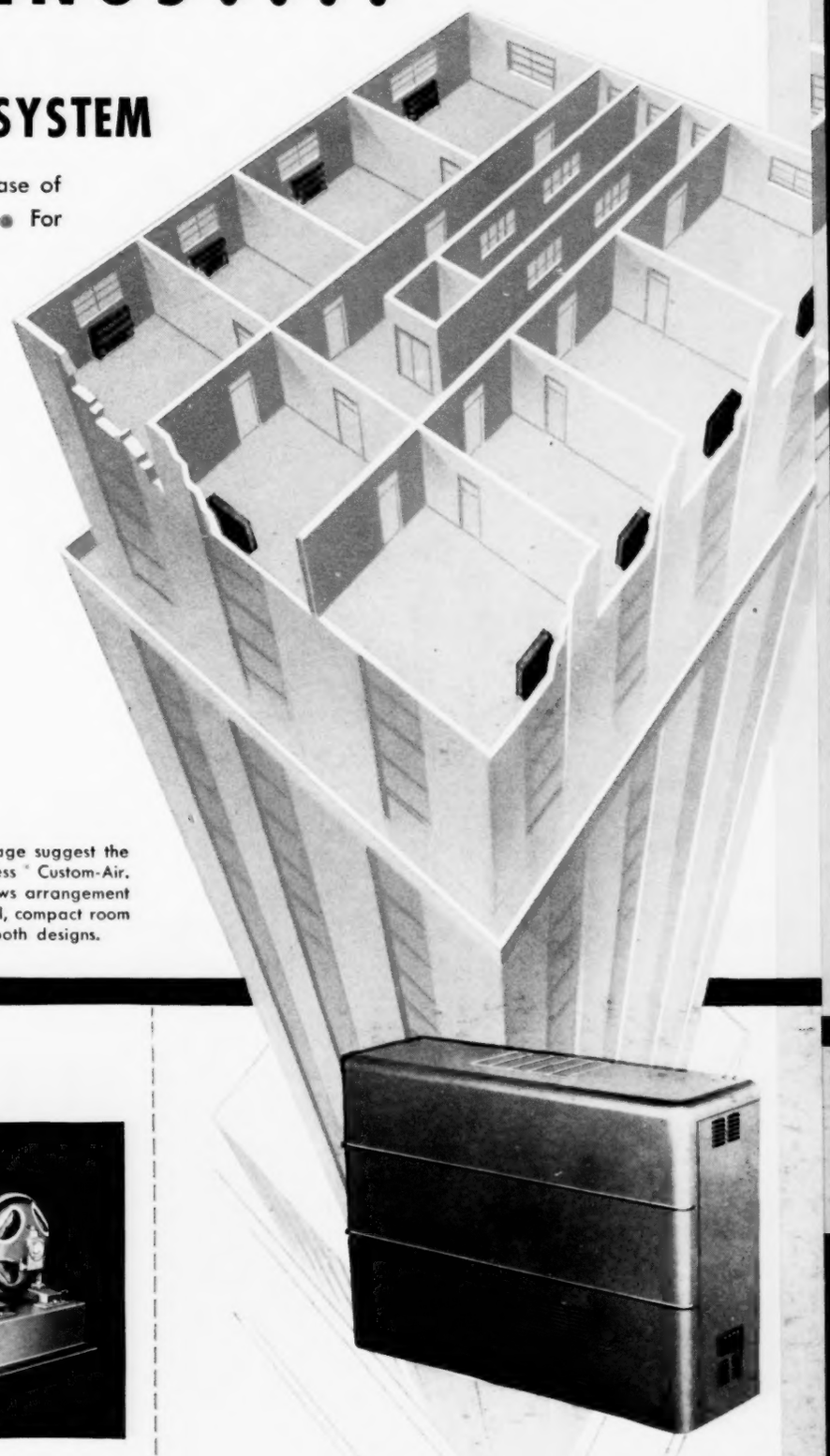
• For complete individual control • For every phase of air conditioning • For elimination of large ducts • For the finest in air conditioning.

### For Multi-room, Multi-story Buildings

Where it is desirable to give each room in multi-room, multi-story buildings complete individual temperature control, the Trane Custom-Air System is the perfect answer. Individual room units provide sensible heating and cooling, filtering, and circulation of air. Self-powered, they do not depend on the operation of a central fan system. The new Trane Custom-Air System provides the most flexible, most effective, most economical system of air conditioning ever designed for large buildings.

### TRANE CUSTOM-AIR CONDITIONING

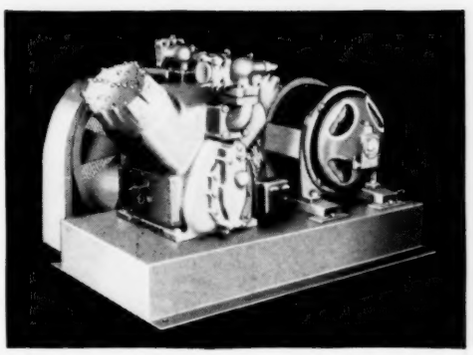
Trane Custom-Air Conditioning is available either with or without ductwork, as specified. Both systems have the same trim room units and have the same exclusive features. Building conditions, the existence of ducts from earlier types of systems, and other similar conditions dictate whether the duct-type or the ductless will be most advantageous for any given case.



Illustrations on this page suggest the simplicity of ductless Custom-Air. Cover illustration shows arrangement used with ducts. Small, compact room units are used with both designs.

### For ALL TYPES of REFRIGERATION

**Trane Compressors and Condensing Units** range in capacity from 3 to 100 tons. Uniform features: operation at moderate speed for long life and efficiency, forged alloy steel crankshafts, seal bearing rings lapped to optical flatness, and complete interchangeability. Capacity unloading available on all except smallest sizes prevents short cycling under partial load conditions.





*Line in the Industry...*

# TRANE

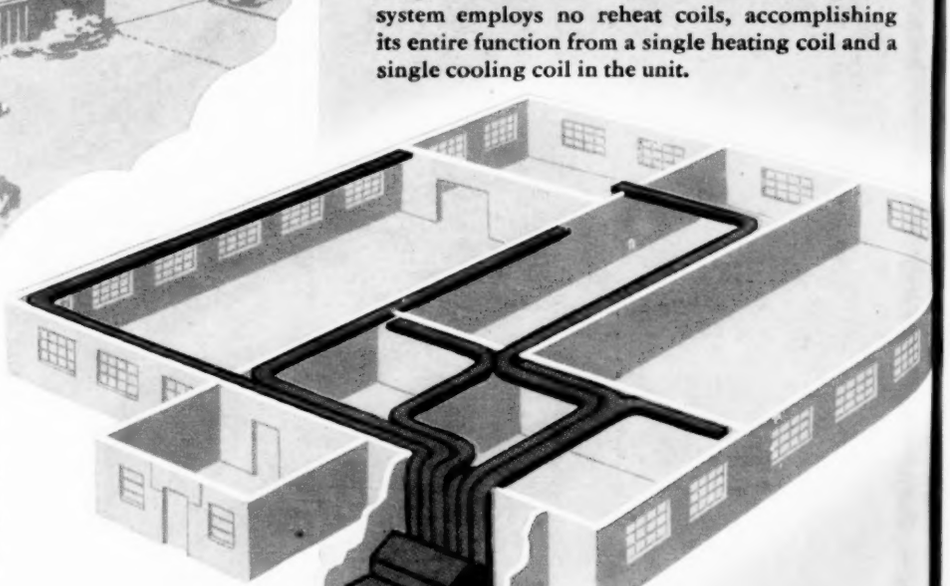
THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# TRANE AIR CONDITIONING for systems

## Systems Especially Desirable for Homes,

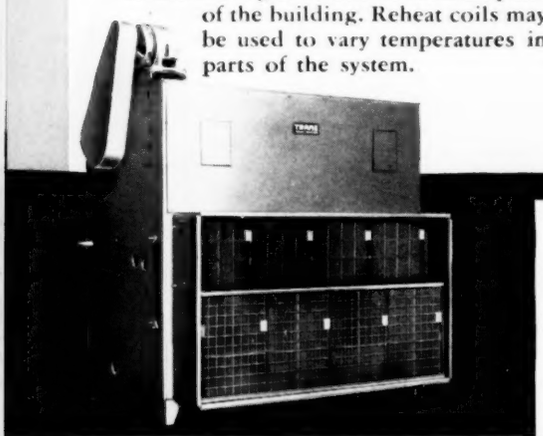
### FOR INDIVIDUAL ROOM CONTROL

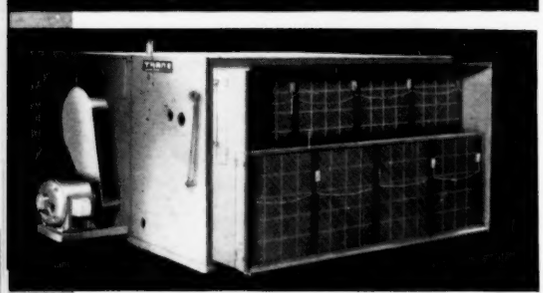
**For groups of rooms or offices requiring individual temperature control, the remarkable new Trane Zone Unit System employs a single unit and ductwork, but provides separately regulated temperature to each area. This outstanding new system employs no reheat coils, accomplishing its entire function from a single heating coil and a single cooling coil in the unit.**



### FOR ECONOMICAL OVERALL CONDITIONING

A Trane central system is the standard method for economically supplying conditioned air to residences or groups of offices where there is no objection to the mixing of return air from all parts of the building. Reheat coils may be used to vary temperatures in parts of the system.





### FOR COMPLETE AIR CONDITIONING

**Trane Climate Changers** provide every phase of air conditioning in 24 combinations.

For comfort or process air conditioning, these Trane units may provide any or all phases of air conditioning, in any combination. Steam or hot water may be used for heating and humidification, water or DE refrigerant for cooling. Cleanable or replaceable filters. Outside or recirculated air. More functions may be added to the installed unit.

### FOR PACKAGED AIR CONDITIONING

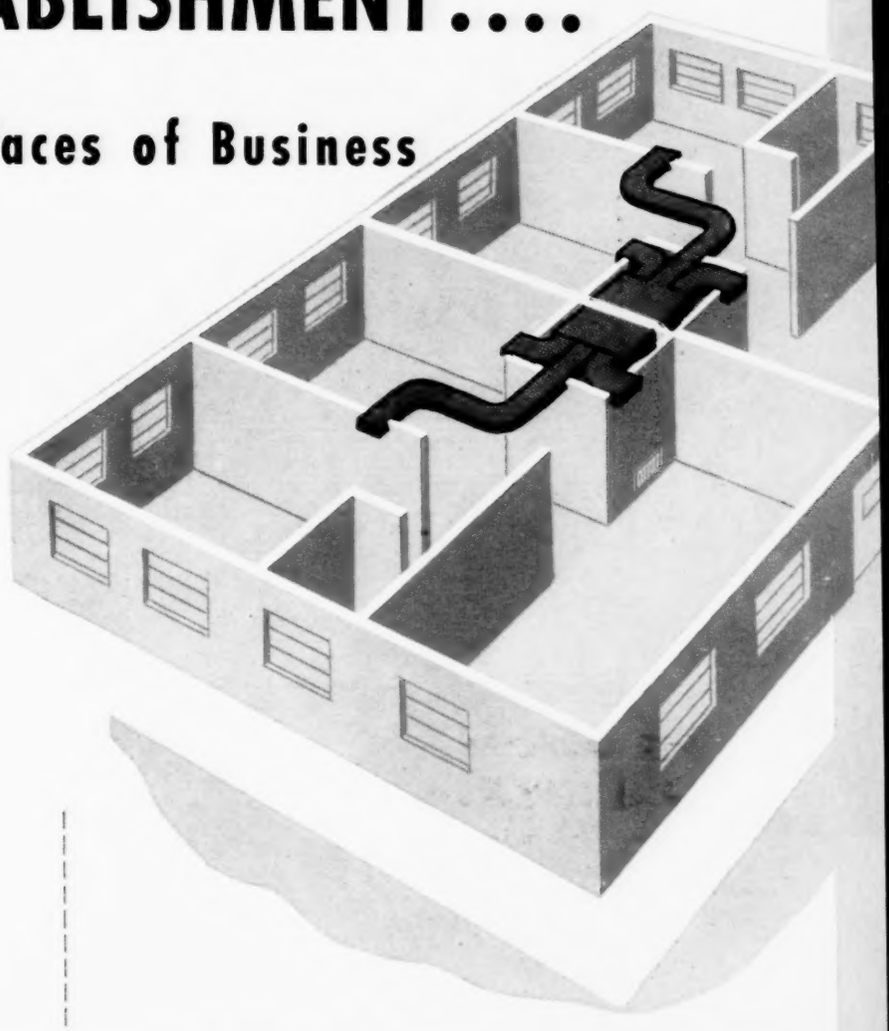
**Trane Self-Contained Air Conditioners** require only simple electrical and water connections. Conditioned air can be delivered direct or through ductwork. Use outside or recirculated air. Fan motor and condensing unit resilient mounted to avoid noise and vibration. Heavy duty compressor with ample condenser provides long dependable life with economical operation.

# TRANE *Manufacturing Engineers of Heating*

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# the SMALL ESTABLISHMENT....

## Stores, and Smaller Places of Business



### FOR SMALL GROUPS OF ROOMS

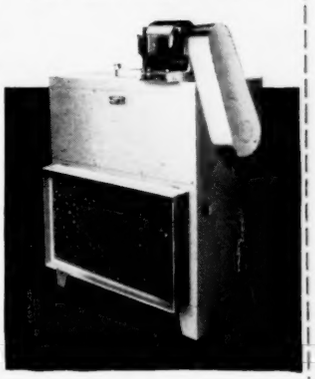
Trane Apartment Systems are designed for use in related groups of rooms, such as hotel suites, small apartments, or connecting office groups. Such systems are planned to produce even, uniform temperature in each group served. Often little or no ductwork is employed. A remarkably small Trane Climate Changer that can be furred-in or concealed in the top of a closet is used.

### TRANE SYSTEM FLEXIBILITY

All Trane systems share in having a great degree of flexibility. Any Trane system can provide every phase of air conditioning—heating, cooling, filtering, humidification, dehumidification, ventilation, and circulation. Any Trane system can be installed to provide all or any part of these functions. In most instances, systems can be installed for heating only, with cooling functions to be added later without excessive changes. For complete system harmony, remember that all Trane products are designed and built together for use together. In this way—and *only* in this way—can the advantages of Engineered Air Conditioning be secured at mass production prices.

### FOR CONDITIONING SMALL AREAS

• **Trane Double-A Air Conditioners** provide complete air conditioning, yet use minimum space.

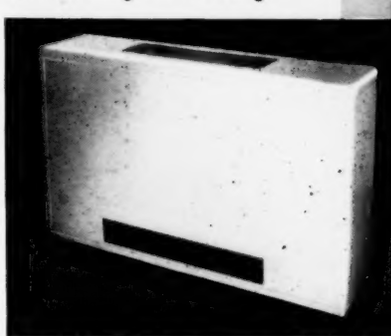


Any or all of the air conditioning phases may be supplied by these units. Intended for use in small apartments, hotel or office suites, or de luxe tourist cabins, units will fit into top of a closet, or may be furred-in within a very small space. Horizontal and vertical models. Use steam or hot water and chilled water.

### FOR SINGLE ROOM CONDITIONING

• **Trane Floor-Type Climate Changers** are compact, handsome units for both heating and cooling.

These units provide heating, cooling, filtering, and circulation for single rooms. Occupy little floor space. Use outside or recirculated air. Supplied with steam or hot water and chilled water from central system. Available in popular sizes, finished in gray or brown enamel. Ideal for bedrooms, offices, hotel rooms.



*and Air Conditioning Equipment* **TRANE**

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# TRANE AIR CONDITIONING for systems

## *Modern Industries Need Heating, Cooling, Ventilation, Circulation, and Humidity Control*

Air Conditioning plays a vital part in more and more of today's industries, and a helpful part in all of them. Whether several or all of the functions of air conditioning are necessary to a process, or whether air conditioning is used for greater employee comfort, and therefore greater output, there is a Trane system that will exactly meet every requirement. Contact the nearest of 85 Trane field offices.

### FOR EMPLOYEE COMFORT

The most obvious need for comfort air conditioning in industry is in cases where either processes or outdoor temperatures produce interior heats which affect worker productivity. Extreme sun effect in plants requiring large glass areas for maximum natural light may also be offset by comfort air conditioning. Other conditions: excessive or inadequate humidity, from natural causes or processes; excessive dust, smoke, gases or vapors. Comfort air conditioning almost invariably results in higher work output, and its effects in raising employee morale are beneficial beyond question.

### FOR CRITICAL ATMOSPHERES

Many industrial processes require the maintenance of special temperature and humidity conditions. Trane systems have been designed to maintain unvarying temperature and humidity for the manufacture of parts to very close tolerances; to provide constant high humidity in textile mills; to furnish cool air for chocolate dipping rooms; to establish and maintain correct humidity for fast, safe handling of dry powdered products; countless other systems make industrial processes safer, faster, more accurate, and more uniform.

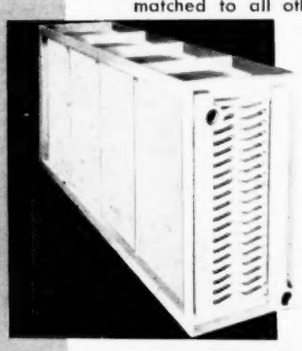
### FOR USE IN PROCESSES

Trane systems provide heating and cooling that is a vital part of countless industrial processes and operations. Trane systems chill water for applications ranging from cooling rollers in printing presses to cooling kettles in food factories. Other Trane systems cool lubrication and transformer oil, while still others cool brine for many uses. Trane systems furnish blasts of very cold air for food or product chilling, and there are Trane systems that produce extremely dry air where moisture must be removed from products. Trane systems recover valuable volatile gases in many applications.

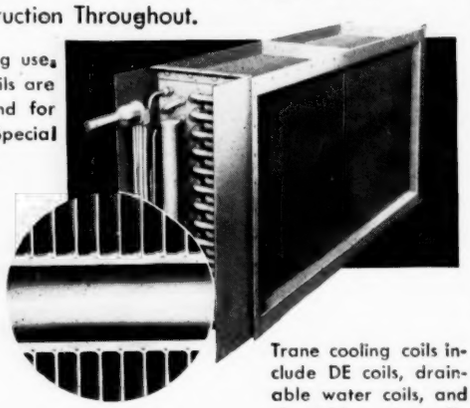
## TRANE HEATING and COOLING COILS

- Steam or Hot Water Coils
- Chilled Water and DE Refrigerant Coils
- Famed Trane Fin-and-Tube Construction Throughout.

**Trane Coils** cover every heating and cooling use. Complete range of types and capacities. Coils are matched to all other Trane equipment. Send for complete coil catalogs. Special purpose coils available.

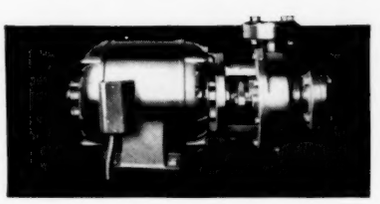


Four types of Trane heating coils, including new Trane SD coil with Kinetic Orifice.



Trane cooling coils include DE coils, drainable water coils, and cleanable water coils.

## FOR WATER CIRCULATION



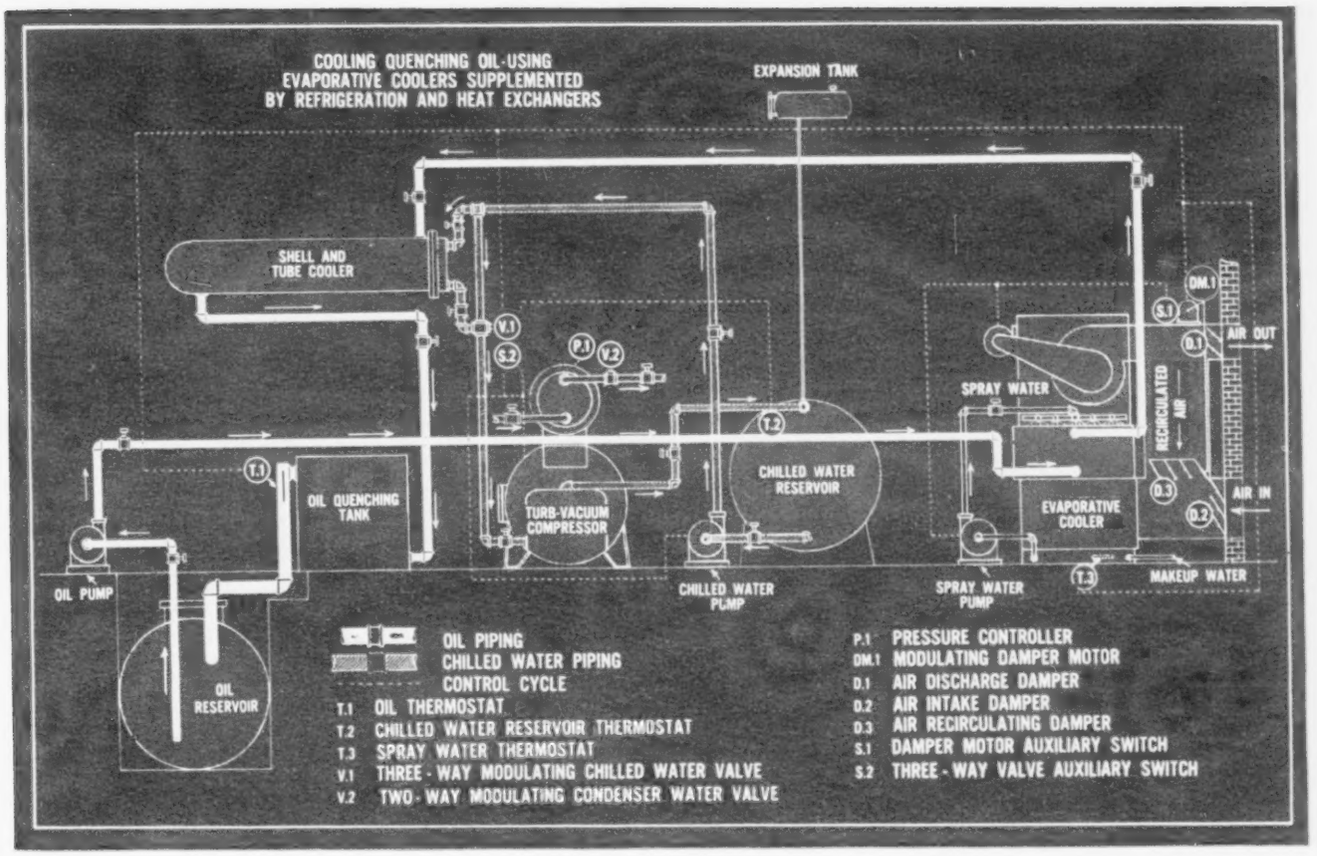
**Trane Circulating Pumps** are used in cooling and refrigeration systems, as well as heating systems. Pumps are balanced to avoid noise and vibration. Deliver large quantities of water against high heads. Broad capacity range.

# TRANE

*The Undivided Responsibility*

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# INDUSTRIES AND PROCESSES



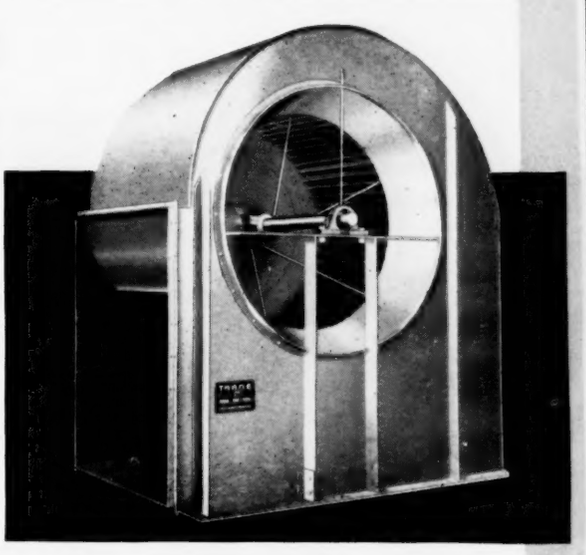

## FOR LIQUID COOLING

**Trane Evaporative Coolers** cool liquids by the evaporation of water. Cut cooling water use by as much as 90%, since only evaporated water is made up. Recommended in zones where wet bulbs average 80° or below. Can be used for cooling water, oil or other liquids.

## FOR AIR CIRCULATION

• **Trane Fans** include forward curved and backwardly inclined centrifugal fans, propeller fans, and utility fans.

Centrifugal fan diameters range to 89", available with direct or belt drive. Fans under 30" feature airtight lock-seam construction. Choice of ball, oil ring sleeve or graphite insert bearings. Choice of discharge directions. Packaged utility fans include forward curved belt-driven fans from 8" to 30", backwardly inclined fans from 15" to 30", and both types of direct-driven fans in sizes from 4½" to 21".



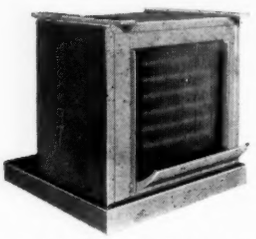
*of One Manufacturer...*

# TRANE

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# TRANE AIR CONDITIONING systems

## for Special Applications

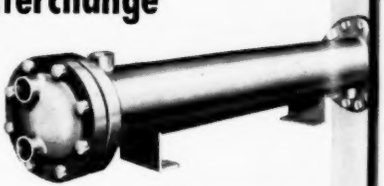


### for Cold Storage

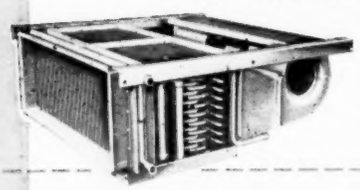
**The Trane Product Cooler** is used in large refrigerators and walk-in boxes, as well as in special cooling applications. Use with chilled water or DE refrigerant.

### for Special Heat Interchange

**The Trane Shell-and-Tube Heat Exchanger** is used for the transfer of heat from liquid to liquid. It may be used with hot or chilled water, steam, or refrigerant.



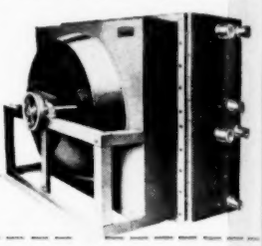
### for Railroad Air Conditioning



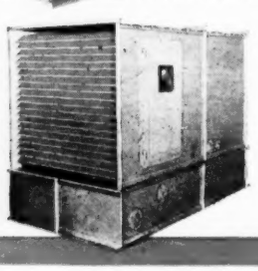
**Trane Railroad Air Conditioners** furnish ventilation air; warmed or cooled, filtered, and humidified or dehumidified for railroad passenger, freight, or baggage cars. Also systems for trucks and busses.

### for Engine Cooling

**The Trane Diesel Engine Cooler** is one of a series of units designed by Trane for cooling jacket water or lubricating oil for internal combustion engines, both gasoline and diesel.



### for Air Washing



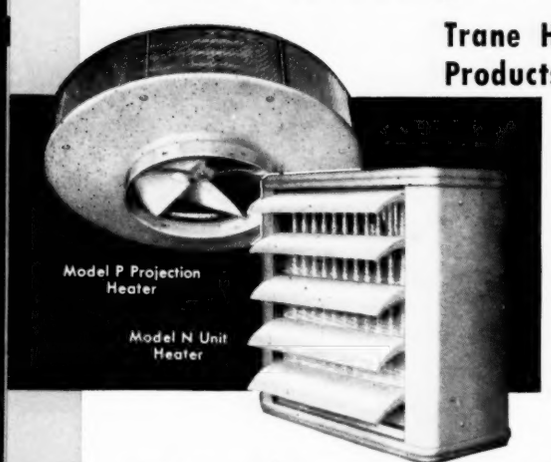
**The Trane Air Washer** removes dust and certain odors from the air by washing. Also provides controllable humidification. Capacities from 3,000 to 100,000 cfm.

### for Industrial Liquid Cooling

**The Trane Dry Expansion Chiller** provides chilled water and other liquids for comfort or process uses, and is useful for eliminating long runs of refrigerant piping.

## TRANE Heating Products are a Part of Air Conditioning

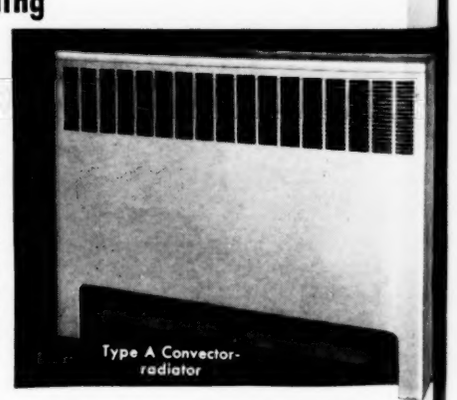
### Trane Heating Products Match Trane Cooling Products for Complete Trane Systems



Model P Projection Heater

Model N Unit Heater

The Trane Line of heating products completely covers domestic, commercial, and industrial heating in all phases. Trane was the originator of the Projection Heater and the Convector-radiator, and these efficient units are finding more widespread use every day. All Trane heating products, as well as all Trane cooling products are designed and built together for use together. Architects, engineers, and contractors draw on this single source and this undivided responsibility to plan entire Trane systems. 200 Trane Field Engineers in 85 principal cities co-operate with them.



Type A Convector-radiator

Trane Float and Bucket Traps

The Trane Lifetime Valve

Trane Flo-Valve and Flo Fittings

The Trane Circulator

The Trane Torridor

The Trane Unit Ventilator

# TRANE

*Engineered Air Conditioning*

THE TRANE COMPANY, LA CROSSE, WISCONSIN • Also TRANE COMPANY OF CANADA, LTD., TORONTO

# Twin-gineered TO FIT YOUR APPLIANCE

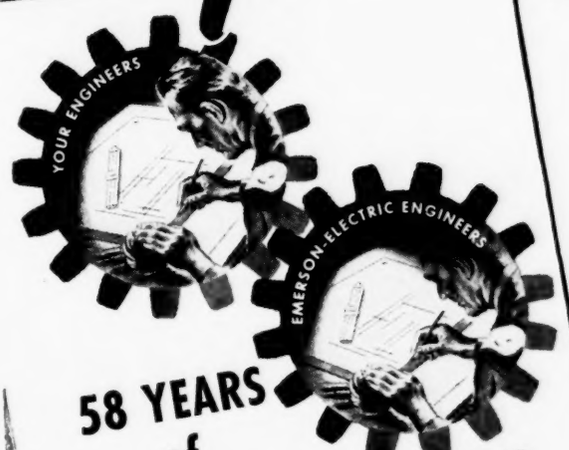
Meshing the right type of "power" with the right kind of motor-driven appliance is more than a ONE-man job. It calls for collaboration between motor and appliance engineers, and the earlier such partnership is established, the better for both!

Such collaboration — *Twin-gineering,* we call it — may save you considerable engineering back-tracking — may suggest many money-saving short cuts in manufacturing — may help you equip your new or improved product with the operational efficiencies necessary for greater user-satisfaction and market success.

Emerson-Electric engineers are now at your service, ready and able to gear their ideas, experience and skill to yours. To add this vital cog to your own business success, write to Emerson-Electric TODAY; there is no charge for this service.

**THE EMERSON ELECTRIC MFG. CO., St. Louis 21, Mo.**

*Branches:* New York • Chicago • Cincinnati • Detroit • Los Angeles • Davenport




**58 YEARS of Engineering Experience MESHED with YOURS...**

Pioneers in the manufacture of motors, 1/20 to 5 H.P., Emerson-Electric engineers mesh their experience with yours in supplying the correct motor for efficient and economical appliance performance.

1/20 to 5 H.P. AC and DC

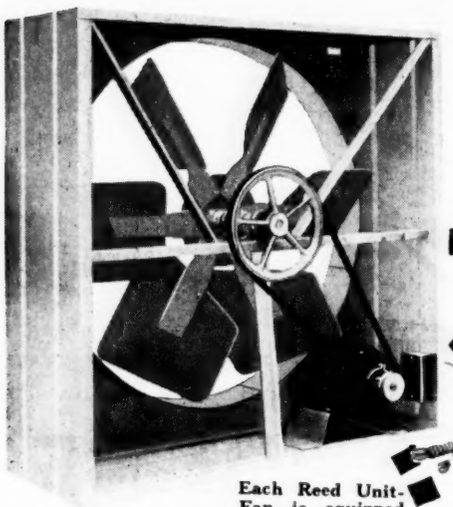
**EMERSON ELECTRIC**

MOTORS · FANS — APPLIANCES

# SIMPLIFY YOUR SALES . . . MULTIPLY YOUR PROFITS!

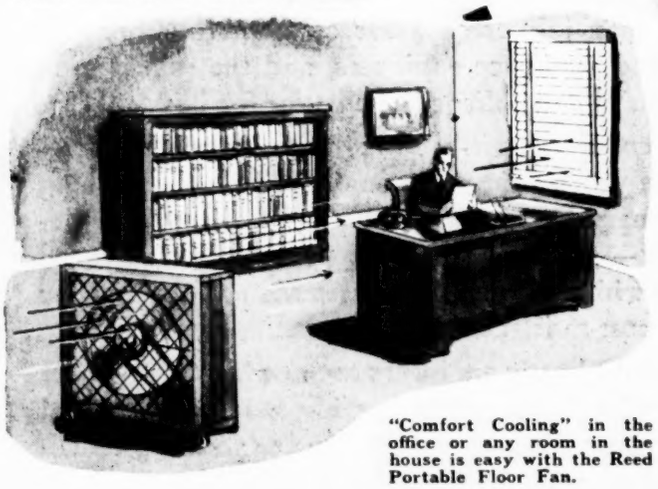
Reed Unit-Fans offer you the opportunity for "comfortable" profits on increased sales, with "comfortably" low inventory costs. With the addition of simple attachments to the basic Reed Unit-Fan — you can display window fans, attic fans, portable floor fans or commercial exhaust jobs. A dealer has only to stock basic fan models in different sizes to serve this wide variety of uses.

## THE SAME REED UNIT-FAN IS USED



Each Reed Unit-Fan is equipped with a heavy duty reversing switch with middle off position, and a 10-foot cord and plug. Fan case is finished with two coats of light ivory, baked synthetic enamel. Blades are sheet aluminum.

In its role as a window fan, the Reed Unit-Fan is attractive in appearance and provides cool comfort throughout the home.



"Comfort Cooling" in the office or any room in the house is easy with the Reed Portable Floor Fan.

Quickly and easily installed in the attic, the Reed Unit-Fan removes hot air and fills every room in the house with cool, moving air.

**Only Reed "Comfort Cooling" Units, offer you these features. Dealerships are now available. . . . Write today for catalog, prices, etc.**

R-U-F TRADE MARK

## REED UNIT-FANS, INC.

*Manufacturers of Ventilating Equipment*

1001 St. Charles Ave., New Orleans 8, La., U.S.A.

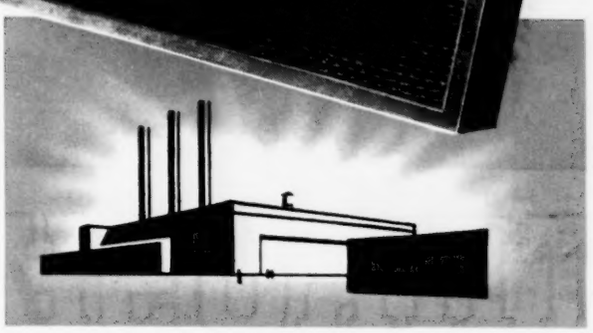
Certified Ratings AMCA

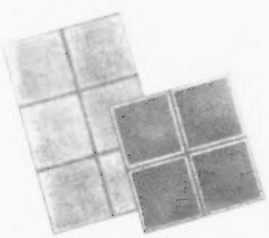
# MODERN INDUSTRIES

**specify**

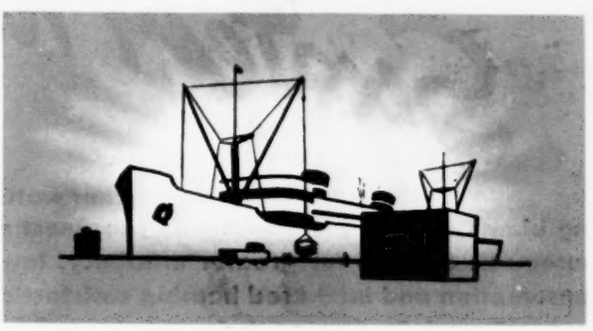
# FAR-AIR® FILTERS

MANY of the world's largest industries use FAR-AIR Filters because they are more efficient and more economical. Higher dirt-holding capacity without large loss of efficiency reduces maintenance costs. Filters can be thoroughly cleaned in place with only a pressure hose—a great saving in expensive maintenance time.

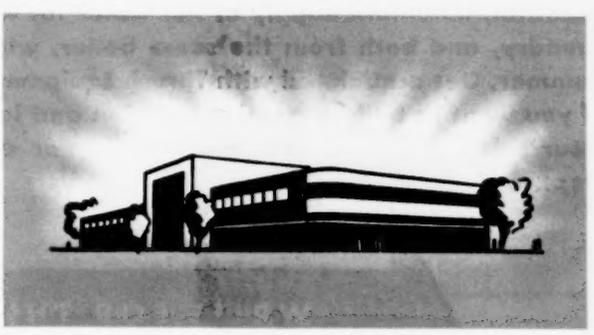




FAR-AIR unique herringbone-crimped construction assures higher air velocities without sacrificing efficiency. This means two FAR-AIR Filters will do the work of three ordinary filters. Real savings in initial installation costs can be effected because FAR-AIR filter area can equal coil area and eliminate expensive plenum chambers.



FAR-AIR Filters load progressively as shown in the diagram because of herringbone-crimp construction. This means a more even distribution of dirt throughout the media which permits efficient operation up to 3 times longer between servicings even under the most difficult operating conditions.



**Write today for your free copy of FAR-AIR Filter Catalog.**

*herringbone-* *-corrugations*



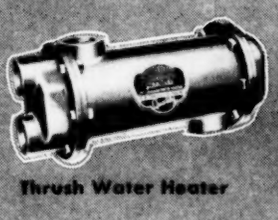
**FARR COMPANY**
*Manufacturing Engineers*
Los Angeles
Chicago • New York
OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

## ALL THAT YOUR CUSTOMERS WANT IN HEATING

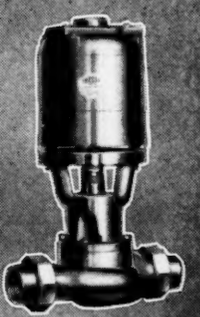
**FORCED CIRCULATING**
**THRUSH FLOW CONTROL**
**SUMMER — WINTER**
**HOT WATER HEAT!**

# THRUSH System has everything

**EQUIP** the hot water heating plants of your customers with the finest modern automatic controls for greater efficiency, lower fuel consumption and increased heating satisfaction. This means Thrush System, with forced circulation and a plentiful, automatic supply of hot water for kitchen, laundry, and bath from the same boiler, winter or summer. Get acquainted with Thrush Equipment now if you want to build a good reputation and increase your sales. Ask your wholesaler today or address Dept. D-3

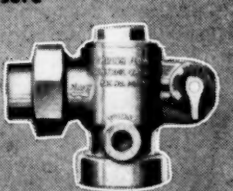


Thrush Water Heater



Thrush Water Circulator

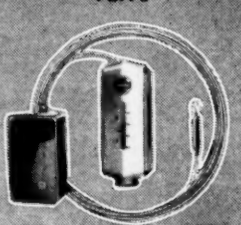
Airtight Pressure Tank



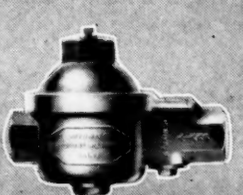
Thrush Flow Control Valve



No. 4 Water Pressure Relief Valve



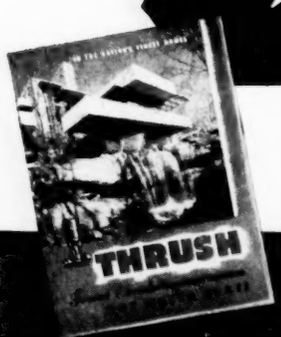
200 201
No. 201 Radiant Heat Control



No. 12 Automatic Filling Valve

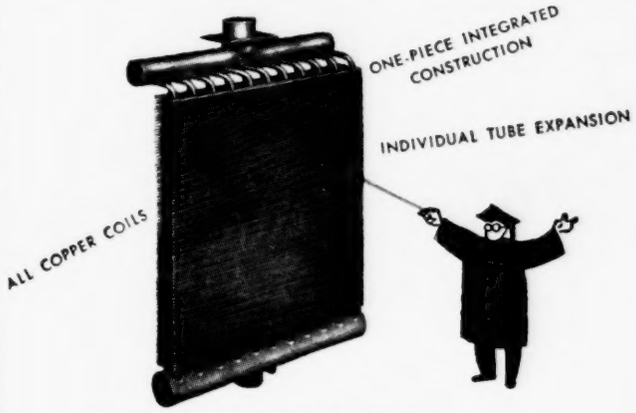
**WRITE FOR THIS *New* HOT WATER HEATING BOOKLET**

*A new sales aid that will help you sell more Thrush Systems.*



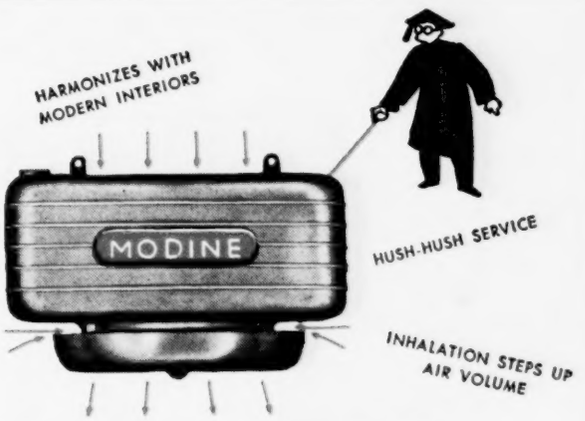

**H. A. THRUSH & COMPANY** PERU, INDIANA

# Up-to-the-Minute Answers to Your Unit Heater Questions!



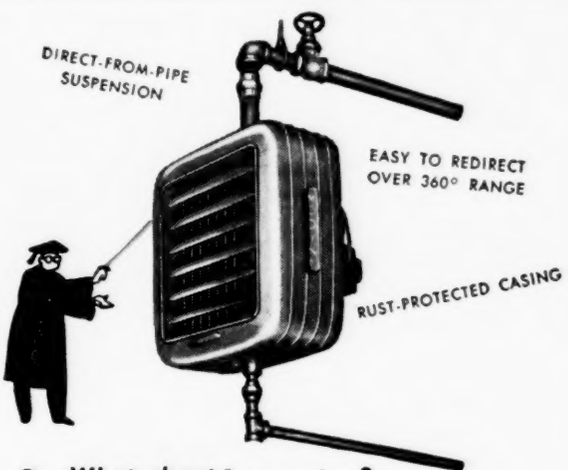

**Q. *Are Coils made to last?***

**A.** Modine coils defy corrosion and deterioration because fins are metallically bonded to tubes, tubes brazed to headers. No screwed or expanded joints, no gaskets or bolts mean greater strength, longer life.



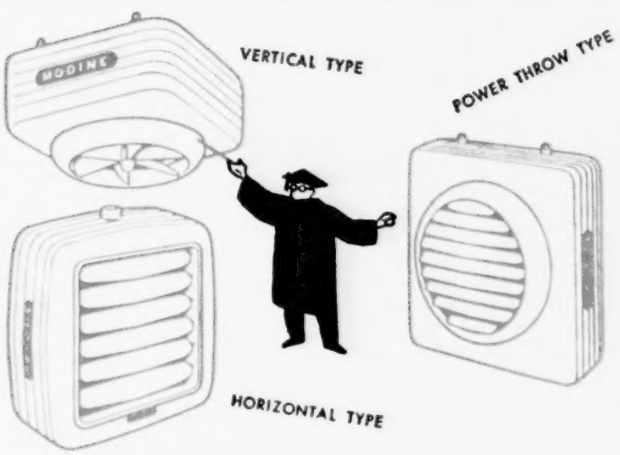

**Q. *Is Performance as you like it?***

**A.** You get uniform temperatures, precisely controllable for perfect comfort, low cost because of Modine's flexible heat delivery. Heavy-duty motors are certified for quietness by laboratory sound ratings.




**Q. *What about Suspension?***

**A.** Patented Modine center supply and return connections mean Horizontal unit can be suspended directly from supply line with safety. No expensive supports. No extra labor costs. Savings to $10 per unit.




**Q. *Will it fit your Application?***

**A.** Modine's complete line meets your needs with 3 types and 47 capacities: 1) Horizontal Type for general applications. 2) Vertical Type for overhead use. 3) Power Throw Type for special high velocities.

## GOOD ADVICE: Specify Modine High Quality!

Compare Modine cost . . . compare Modine design . . . compare Modine performance, and you'll see why Modine offers you today's greatest unit heater value . . . *the* quality unit heater for your needs! For more facts, call Modine's representative listed in the "Where-to-Buy-it" section of your phone book. Or send in coupon at right.

**Modine UNIT HEATERS**

MODINE MANUFACTURING CO.
1511 Dekoven Avenue
Racine, Wisconsin

YES! I want all the facts about Modine's integrated Unit Heater Line. Please send me complete information.

NAME .....

ADDRESS .....

CITY ..... STATE .....

The Alnor Velometer Jr., 4" x 3" x 1½"; available in single or double range scales; double-pivoted, double-jeweled movement for increased accuracy.

# *Announcing* the New Alnor Velometer Jr.!

Here's the *new* Alnor Velometer Jr.—Illinois Testing Laboratories' most recent perfection in precision air velocity measurement instruments. A small, portable, completely self-contained unit, the new Velometer Jr., answers a long felt need for an accurate, instantaneous direct reading instrument that is *low in cost.*

Amazingly accurate . . . easy to read, this inexpensive Velometer gives direct reading of air velocity in feet per minute *without* bothersome timing, calculations or reference to tables and charts. The new Velometer Jr., can be adapted to a score of uses when installing new work or maintaining efficient operation of established systems. Send for bulletin and prices!

*Alnor* **PRECISION INSTRUMENTS FOR EVERY INDUSTRY**

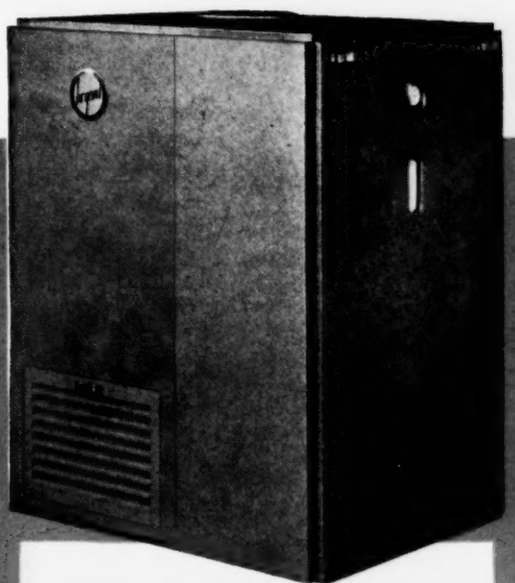
**ILLINOIS TESTING LABORATORIES, INC.**
**Room 514, 420 N. La Salle Street, Chicago 10, Illinois**

# SIZED TO FIT

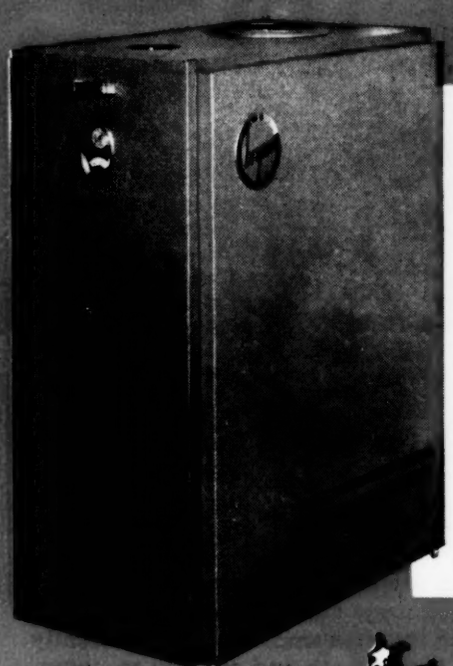
## YOUR REQUIREMENTS FOR

# radiation heating

•Like fitting a gown to a personalized form . . . you can meet exact requirements on your domestic, commercial or industrial radiation heating job with one of the *thirty-six* automatic gas-fired boilers provided by the Bryant Line. Bryant Boilers are rated from 67,500 to 3,996,000 btu per hour, backed by full automatic operation, long-life, cast-iron sections and high operating efficiency . . . all proved in thousands of on-the-job successes since 1908. For perfect *fit* in hot water, steam and vapor systems, or for hot water storage applications, choose your gas-fired boilers from Bryant's *thirty-six* sizes . . . the *perfect 36* for radiation heating.

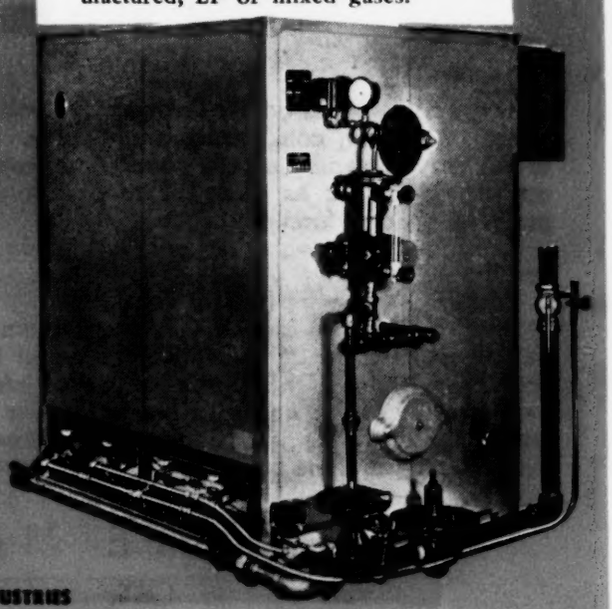


**MODEL 455**—A.G.A. ratings sq. ft.: Steam 660-2860, Water 1060-4580. Inputs: 198,000 to 858,000 btu per hour. For large homes and other buildings of medium and large size. Water tube design provides maximum brushing action to utilize the most possible heat.



**MODEL 26** — A. G. A. ratings sq. ft.: Steam 230-600, Water 360-1920. Inputs: 67,500 to 360,000 btu per hour. For moderate size hot water and steam radiation heating systems. Features maximum heating surface, with water tubes surrounding the combustion chamber. Jacket is asbestos-insulated, completely encloses boiler and controls . . . A favorite for home radiation heating systems.

**MODEL 630**—A.G.A. ratings sq. ft.: Steam 2960-13,320, Water 4740-21,300. Inputs: 888,000 to 3,996,000 btu per hour. For steam, vapor or hot water systems in large homes, apartments, commercial and industrial buildings. Like all Bryant boilers, operates efficiently on natural, manufactured, LP or mixed gases.



*Let the pup be furnace man*

**bryant**

AUTOMATIC HEATING

BRYANT HEATER COMPANY • CLEVELAND, OHIO • ONE OF THE DRESSER INDUSTRIES

# it's springtime inside!

Now grandma rocks gently through the twilight years . . . warm, comfortable and secure. For to the very old and the very young, year-round warmth is almost as essential to health and peace-of-mind as food or clothing.

Outside the elements may rage but inside it's springtime.

Yes, *steel pipe makes it possible!*

Uniform, dependable heat in every room in any home is a reality largely because of the economical and plentiful production of *steel pipe*. Whether for conventional hot water or steam heating systems or today's counterpart, the radiant panel method, steel pipe provides a combination of advantages that makes modern heating available to more people than ever before. Likewise, the heating systems of our great office buildings and industrial plants rely on steel pipe to function smoothly and efficiently . . . to furnish the warmth and comfort so necessary in our daily tasks.

---

The interesting story of "Pipe in American Life" will be sent upon request.

COMMITTEE ON STEEL PIPE RESEARCH of American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N. Y.

## STEEL PIPE MAKES IT POSSIBLE!

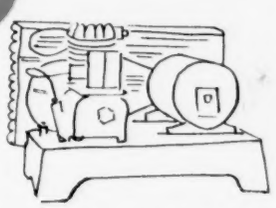
*. . . better living through pipes of steel for plumbing and heating purposes.*

BRUNNER
SINCE 1906

# REFRIGERATION helps you serve better

*Memo to Installation Contractors*

## 10%=100%

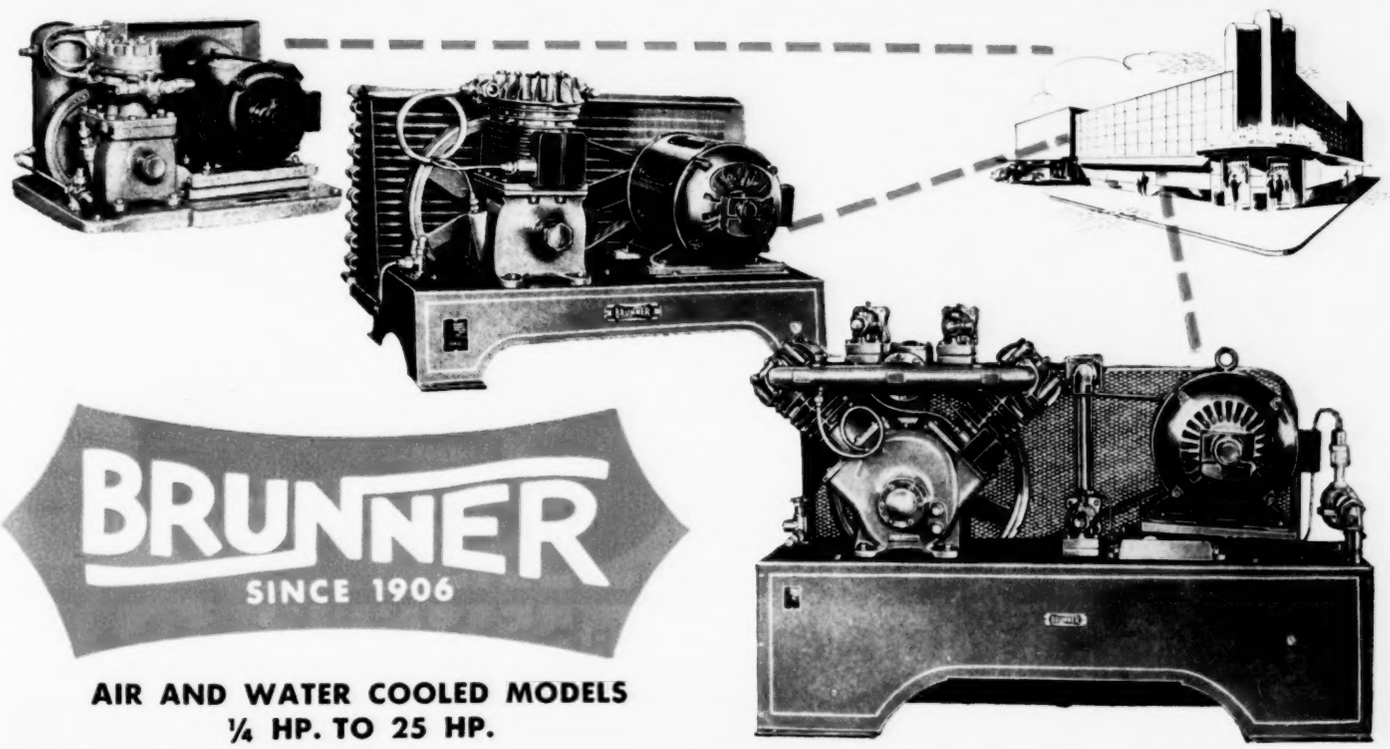


'Tain't so you say but consider this: In the installation of refrigeration for food processing, locker plants, air conditioning and such the actual condensing units required will probably account for much less than 10% of the total installation contract. Now think: The entire usefulness of the total investment is wholly dependent upon the service rendered by the condensing units.

Your customers depend upon your judgment so give that 10% first consideration. *Check* and *compare* Brunner design, construction, delivered efficiency, service-life, accessibility, delivery. It is definitely to your advantage to become identified with Brunner. *Write us.* No obligation to *know the facts* and our representative* talks your language . . . knows your problems.

*Brunner factory representatives are located throughout the United States.

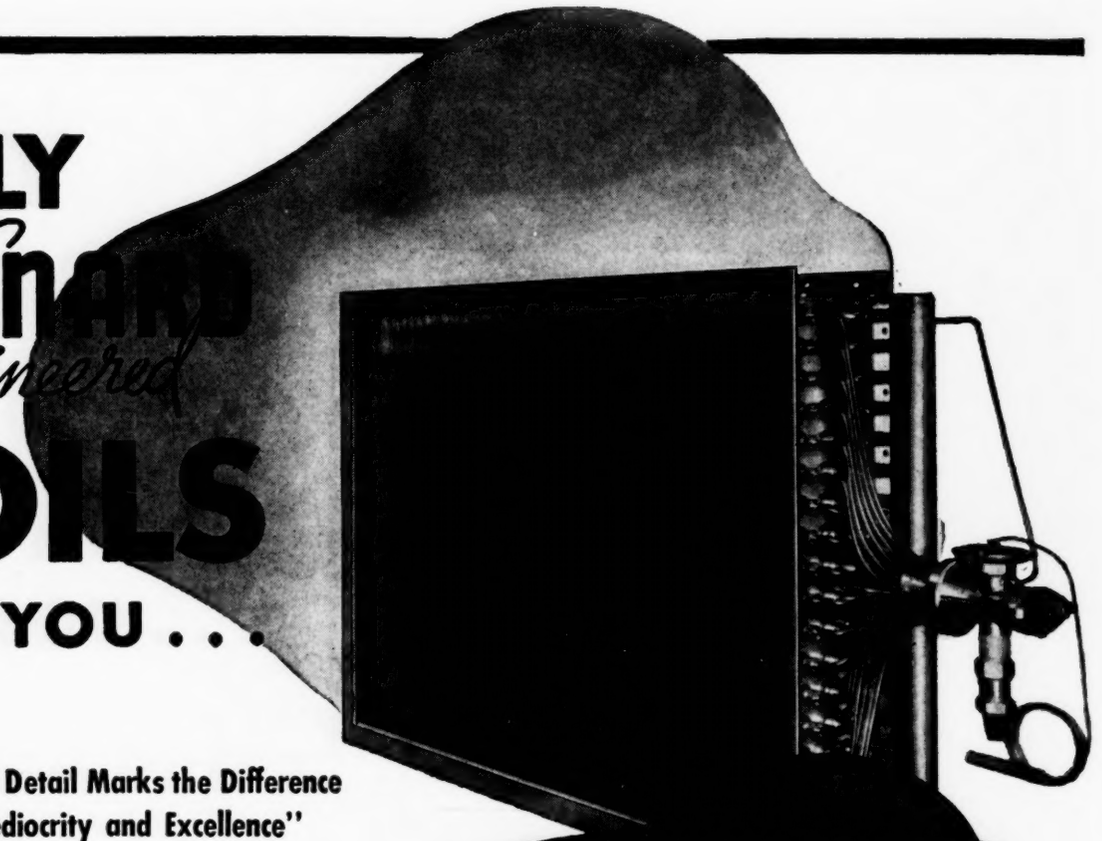
**BRUNNER MANUFACTURING CO.**
UTICA 1, NEW YORK, U. S. A.



BRUNNER
SINCE 1906

**AIR AND WATER COOLED MODELS**
**¼ HP. TO 25 HP.**

# ONLY KENNARD Engineered COILS GIVE YOU . . .



**"Refinement of Detail Marks the Difference Between Mediocrity and Excellence"**

No wonder so many engineers and contractors are specifying KENNARD all the way for their HEAT TRANSFER PRODUCTS.

These fine quality coils offer many exclusive advantages that make for satisfying service and longer life at no higher cost.

*KENNARD COILS* are designed and built by an organization that *specializes* in heat transfer products . . . an organization with the equipment, the personnel, and the engineering "know-how" to do the job best. We are equipped to fabricate ANY type of heating or cooling coils (any refrigerant) on prompt delivery schedules. Your inquiries are invited.

**CLEANER INSIDE SURFACE**
Hydrualic stretching loosens scale and oxides subsequently blown OUT of coil reduces danger of scoring compressor.

**SAFER COIL**
Having withstood 3000 psi for bonding is safe-guarded against leaks.

**UNIFORM EVEN STRESS**
in ALL fins—good mechanical and thermal bond.

**NO-RUST FRAMES**
Frames up to 72" are ALUMINUM. Larger sizes framed in steel, hot-dipped galvanized AFTER fabrication.

**ONE-PIECE FINS**
(All Lengths)
Solid plate type fin for ALL coils. Reduces air resistance. Requires less fan power. Minimizes fuzz and lint fouling.

*Write for*
**KENNARD CATALOG 47-A**
(Finned Coils).
Crammed full of authoritative data with pages of tables to simplify making coil selections.

**OTHER KENNARD CATALOGS**
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*COOLING COILS*
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*BLOWER UNITS*
AIR CONDITIONING
INDUSTRIAL

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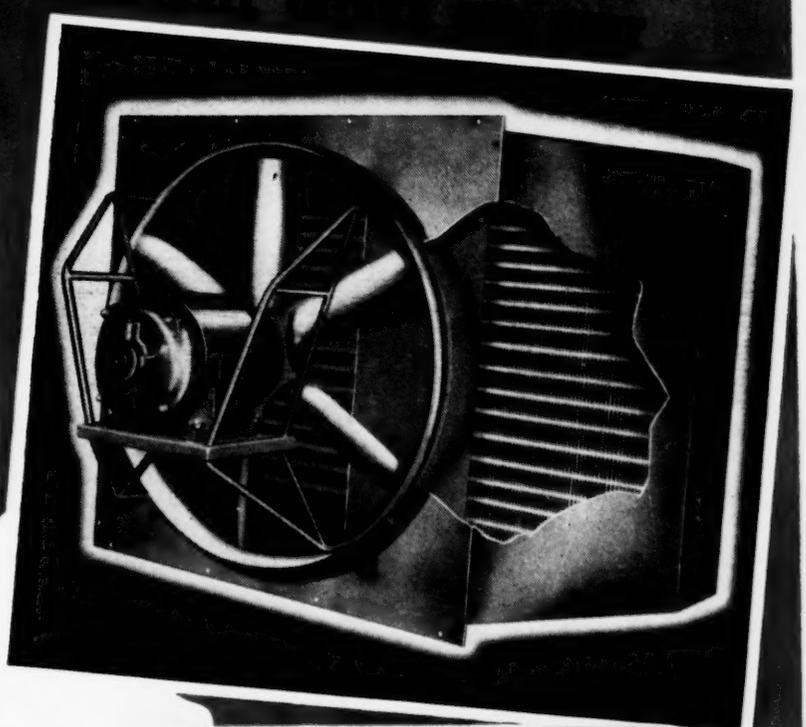
## REPLACE EXHAUSTED AIR WITH TEMPERED FRESH OUTSIDE AIR



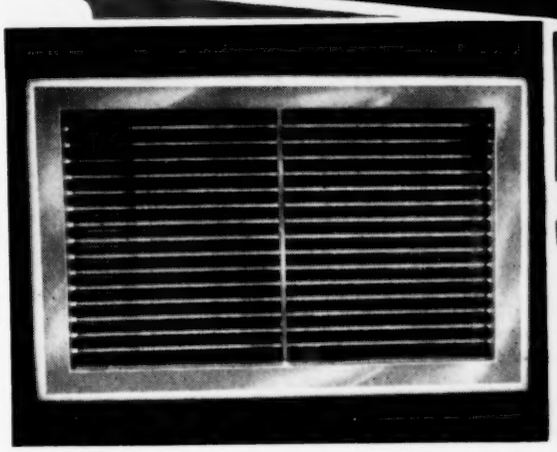
Does a gale of chilly air sweep into your plant when a door is opened? Can you locate cracks and crevices by the flow of cold outside air near them? When your exhaust system is at full operation does it seem to function with less than normal efficiency?

Even if you have not noticed such signs, if you operate an exhaust system without compensating for the air it removes you are "starving" your exhaust fans. Lack of air behind them is as bad as excessive pressure in front of them. It gives the same result—inefficient operation. In addition, it brings in cold air, producing cold spots.

The new Hartzell Intake Air Unit overcomes these troubles in one compact, simple package. It introduces the air needed to balance the exhaust system. It tempers the incoming air to the temperature you select—filters it, too, if you wish. It therefore increases ventilation efficiency and at the same time improves working conditions.

It comes as a complete, self-contained unit, easy to install, and operates with practically no attention. Provision is made for air filters; frame and filters are provided when desired. Automatic and manual controls of various types are also available.

Bulletin 2101, just off the press, gives details of this new development. It's free on request.



***The Hartzell core, properly installed and operated, will not freeze.***

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FLEXITUBE absorbs expansion and contraction strains.

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Specially designed for use where extra-rugged coil is needed for close control. Continuous tube type. Operating pressure 25 to 350 p.s.i., temperature up to 350° F. Pressed steel headers, heavy copper tubing and fins, galvanized-iron casings. Highly efficient. Fast heating. Compact. Write for complete ratings and specifications.

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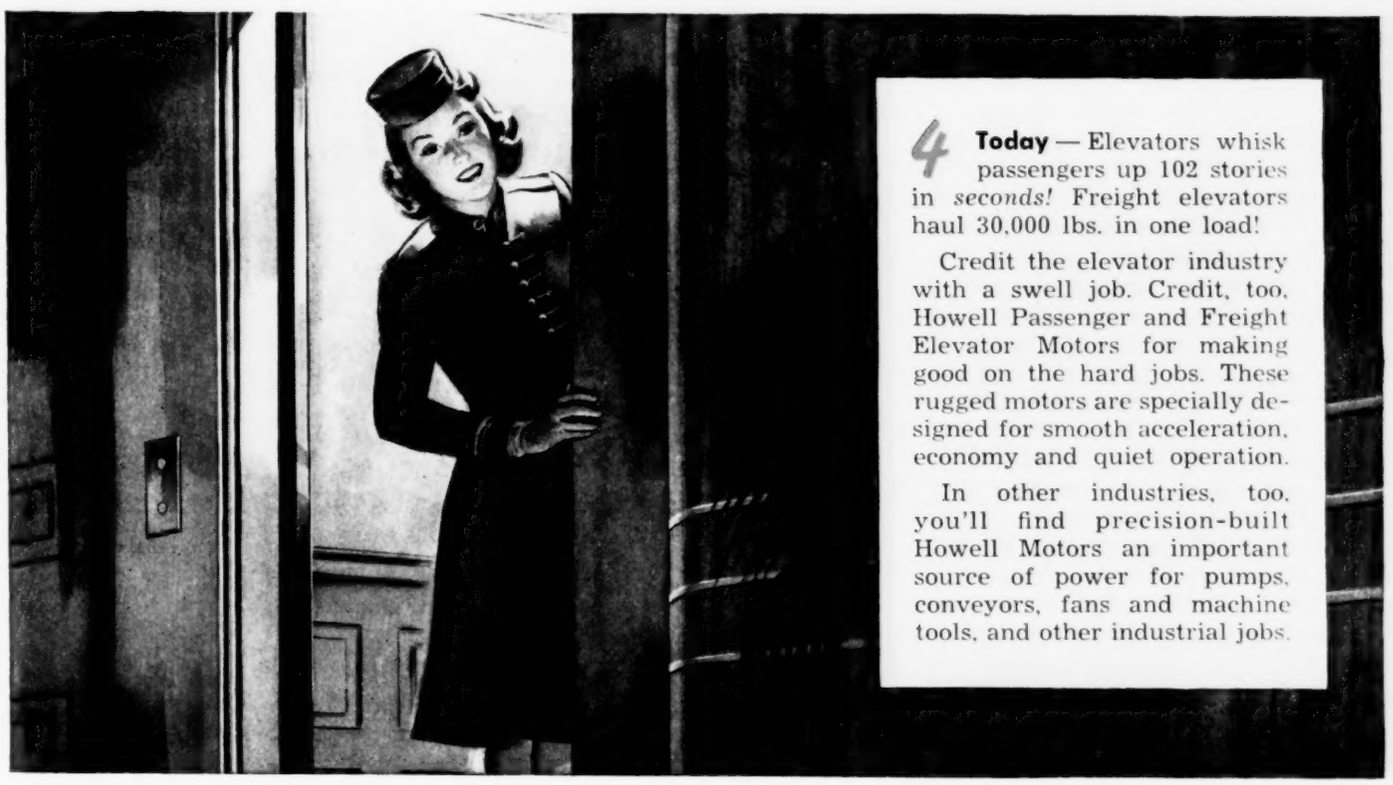
**1** **300 B.C.**—Crude elevators like this helped primitive farmers store grain in bins above ground. Hand operation was the rule though animal power, even water wheels, were used.

**2** **1850**—First elevator in America operated between two floors only. Use of elevators got the first big boost in 1890's with the advent of low-cost electricity and better safety devices.

**3** **1915**—Howell "Red Band" Motors arrived. These rugged, industrial-type electric motors together with safer, stronger, faster elevators ushered in the new era of *skyscrapers.*

# "GOING UP"—*and how!*

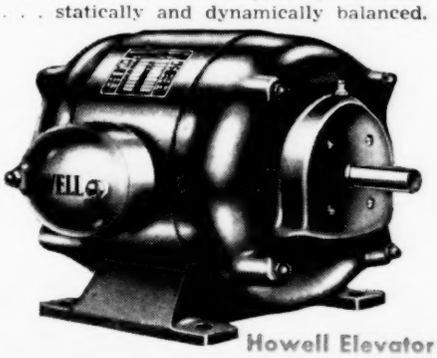


**4** **Today** — Elevators whisk passengers up 102 stories in *seconds!* Freight elevators haul 30,000 lbs. in one load!

Credit the elevator industry with a swell job. Credit, too, Howell Passenger and Freight Elevator Motors for making good on the hard jobs. These rugged motors are specially designed for smooth acceleration, economy and quiet operation.

In other industries, too, you'll find precision-built Howell Motors an important source of power for pumps, conveyors, fans and machine tools, and other industrial jobs.

**Here's** another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.



Howell Elevator Type Motors

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**HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.**

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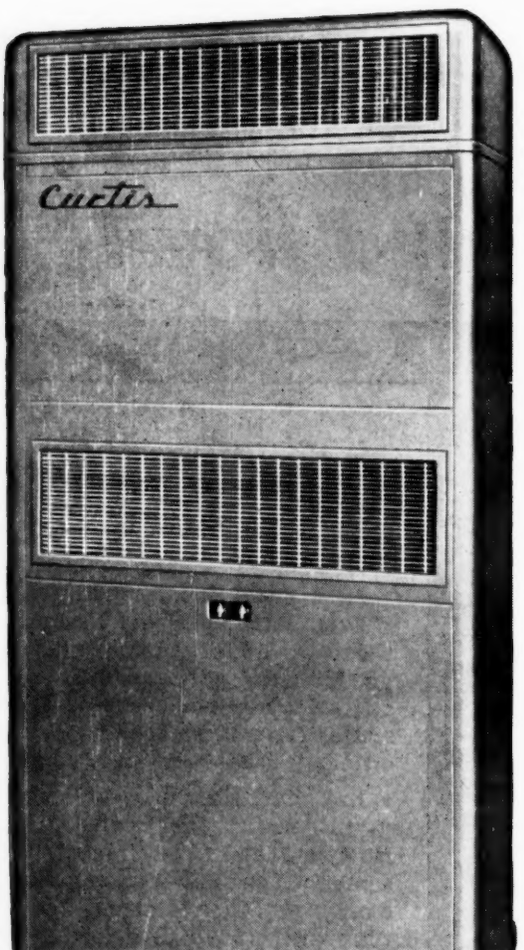


*Curtis Packaged Air Conditioner, Capacities 3, 5, 7½, 10 and 15 tons*

For commercial refrigeration or air conditioning applications the complete Curtis line offers more to your customers — in satisfactory, trouble-free performance, sound, proven design and engineering and lower operating and maintenance costs. Curtis advantages include:

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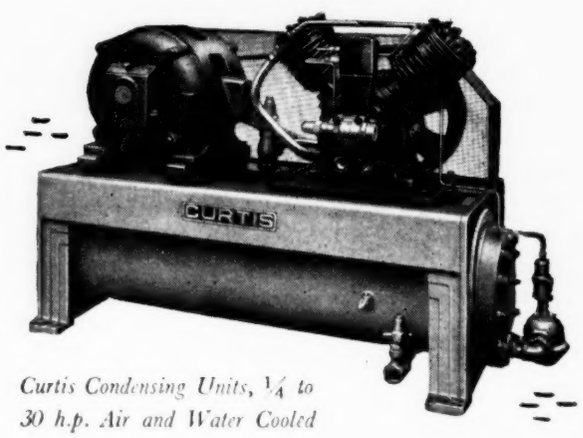


*Curtis Condensing Units, ¼ to 30 h.p. Air and Water Cooled*

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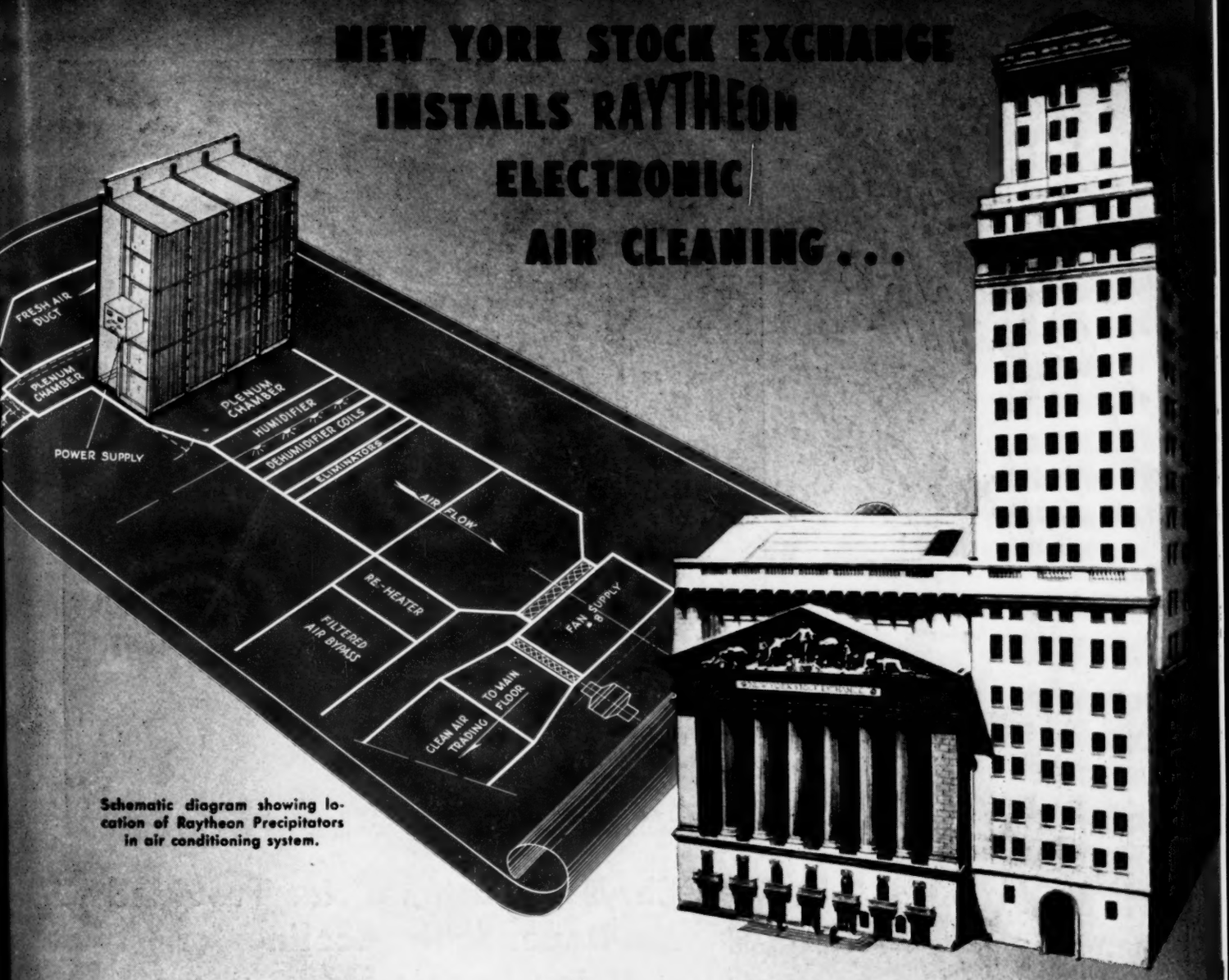
*94 Years of Precision Manufacturing*

# NEW YORK STOCK EXCHANGE INSTALLS RAYTHEON ELECTRONIC AIR CLEANING...




Schematic diagram showing location of Raytheon Precipitators in air conditioning system.

New York Stock Exchange Building equipped with Raytheon Precipitators
Installed by Almirall & Co., Inc.
Consulting Engineer: C. S. Leopold, Philadelphia

To help maintain a clean, healthy atmosphere for building occupants, the New York Stock Exchange installed two Raytheon Precipitators.

The first two units have a 76,500 c.f.m. capacity and the three additional Precipitators will bring the total capacity to 137,250 c.f.m.

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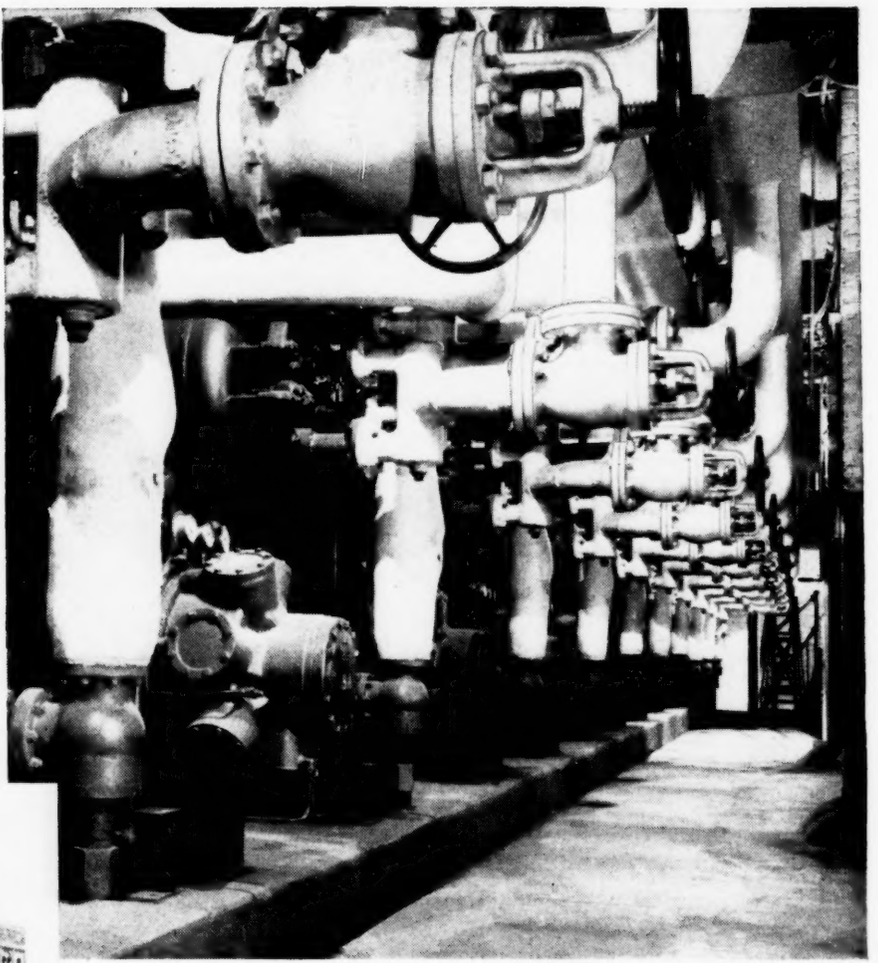

Union Pacific Railroad's 12-story Headquarters Offices in Omaha, Neb., air conditioned by Chrysler Airtemp.

## Chrysler Airtemp Has Provided Dependable Cooling for Union Pacific for 10 years

Over 2000 persons keep cool and efficient in the Union Pacific headquarters offices in Omaha, Nebraska, thanks to Chrysler Airtemp Air Conditioning. Twelve radial condensing units totalling 900 h.p. provide uniform cooling from ground floor to top story of this 12-story office building. Installed in 1938, Chrysler Airtemp precision-built units have demonstrated the meaning of "Engineered by Chrysler" in over a decade of service.

For multiple-story building, or small shop or office, there is a Chrysler Airtemp unit to meet your needs. Discuss your cooling problem with your local Airtemp dealer, or write to us direct.

CHRYSLER AIRTEMP
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# CHRYSLER AIRTEMP

## AIR CONDITIONING

**AIR CONDITIONING • HEATING • COMMERCIAL REFRIGERATION**

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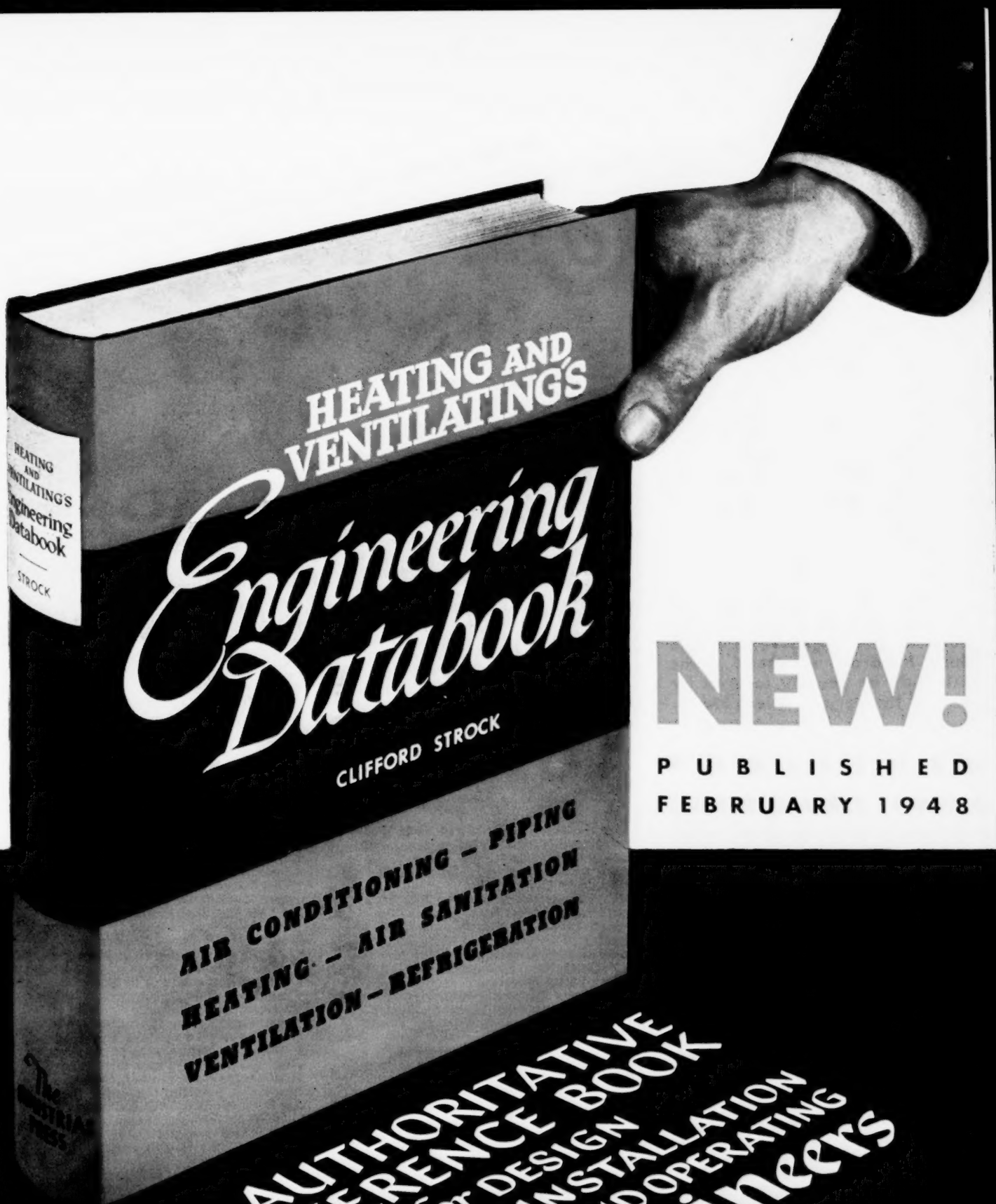
In Canada: Therm-O-Rite Products, Ltd., Toronto

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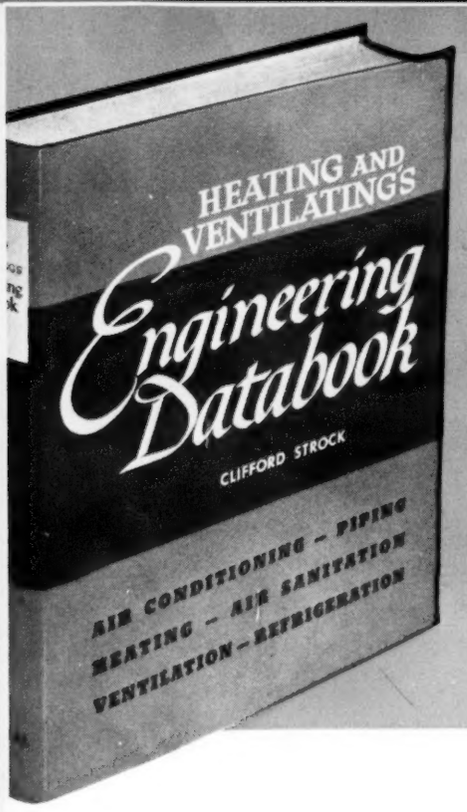


# HEATING AND VENTILATING'S Engineering Databook

**This list of 175 subjects indicates the great scope of the Engineering Databook. These general subjects include hundreds of useful items which may be readily located by means of the very complete index.**

## A Complete Picture of the Contents

Principles of Psychrometry
Properties of Dry Air
Miscellaneous Properties of Water
Thermal Properties of Water
Psychrometric Tables and their Use
Relative Humidity Tables
Dewpoint Tables
Vapor Pressure Tables
Effective Temperature Tables
Absolute Humidity Tables
Psychrometric Charts and their Use
Comfort Air Conditioning Charts
Dewpoint Temperature Chart
Humidity Chart
Altitude Density Chart for Air
Theory of Combustion
Combustion Temperatures; Efficiency of
Air Required for Perfect Combustion
Flue Gas with Perfect Combustion
Heat Lost in Flue Gas
How to Analyze Flue Gases
Dew Point of Flue Gases
Combustion Data for Typical Fuels
What the Flue Gas Analysis Means
Classification and Properties of Coals
Ultimate and Proximate Analysis of Coal
Heating Value of Coals
Sizes of Coal and Coke
Storage Space for Solid Fuels
Combustion Efficiency — Bituminous Coal
Combustion Efficiency — Anthracite
Overfire Jets for Smoke Reduction
Liquid Fuels Class. and Properties
Fuel Oil Weight and Volume Equivalents
Storage Space for Liquid Fuels
Contents of Cylindrical Tanks
Contents of Partially Filled Tanks
Combustion Efficiency — Oil
Gas Fuels, Class. and Properties
Combustion Efficiency — Gas
Determining Equivalents of Fuels
Comparison of Fuel Costs
Chimney Sizing
Chimney Construction
Fundamentals of Fluid Flow
Viscosity of Liquids
Definition of Pipe Fittings
Pipe Threading
American Standard Taper Pipe Threads
Data on Iron and Steel Pipe
Data on Copper Tubing
Carrying Capacity of Pipe and Tubing
Estimating Friction in Cold Water Piping
Cold Water Friction Charts
Estimating Friction in Hot Water Piping
Hot Water Friction Charts
Sizing Steam Piping
Pressure Drop in Steam Pipe Lines
Velocity of Steam in Pipes
Sizing Pipe for Steam, Gases, Vapors
Steam Losses from Piping
Pipe Insulation
Insulation to Prevent Sweating on Pipes
Expansion of Pipe
American Standard for Pipe Fittings
Identification of Piping
Water Hardness and pH Values of Water
Pipe Materials for Corrosion Resistance
Spacing of Pipe Supports
Centrifugal Pumps
Air Velocity Conversion
Velocity Equivalents of Gage Readings
Charts for Duct Sizing
Friction Losses in Elbows
Capacity of Circular and Rect. Ducts
Tables of Duct Capacities
Air Velocity Near Exhaust Hoods
Steel and Iron Sheets
Non-Ferrous Metal Sheets
Estimating Weight of Metal in Ducts
Heat Gains and Losses from Air Ducts
Fans and Blowers
Standard Fan Drive Arrangement
Max. Concentration of Air Contaminants
Potential Industrial Health Hazards
Code for Attic Ventilation
Characteristics of Air Cleaning Methods
Compressed Air Flow Charts
Weight of Air — Press. and Temp. Variants
Compression of Air
Power to Compress Air
Thermometric Scales and Conversion
Specific Heats
Heat Transfer by Convection
Heat Transfer by Radiation
Conductivity of Building Materials
Heat Transmission Coefficients
Inside Wall Surface Temperatures
Heat Loss Through Basementless Floors
Window Condensation
Estimating Amount of Ventilation Air
Ventilation Volume for Buildings
Heat Loss by Air Infiltration
Heat Loss by Humidification
Infiltration Loss for Doors, Windows
Short Cut Heat Loss Estimating
Heat Emission of Cast Iron Radiators
Variation in Air Temperature in Room
Operative Temperatures
Lowest Temperatures Recorded in U. S.
Frequency of Low Temperatures
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Winter Ground Temperatures
No. of Hours Auto. Heating Plant Operates
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Degree-Day Tables
Rating of Heating Boilers
Radiant Heating
Greenhouse Heating
Determining Amount of Steam Flash
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Cold and Hot Water Requirements
Sizing Hot Water Heaters and Tanks
Steam Used by Restaurant Appliances
Heat Wasted by High Inside Temperatures
Checklist for Heating System Servicing
Checklist for Fuel Conservation
Snow Melting
Solar Heating
Electric Radiant Heating
Electrothermal Storage
Heating with Diesel Engines
Outside Temperatures in Summer
Highest Temperatures Occurring Annually
Design Temperatures in Summer
Frequency of High Summer Temperatures
Summer Degree-Hours
Infiltration Losses in Summer
Sun Angles Throughout the Year
Estimating Heat Gains from the Sun
Heat Gains from Pipes and Ducts
Heat Gains from Human Beings
Short Cut Summer Cooling Estimates
Air Conditioning Unit Estimating
City Water Temperatures
Well Water Temperatures
Cooling Water Requirements
Cooling Towers
Refrigeration Heat Quantities
Rate of Circulation of Freon-12
Refrigeration Compressor Capacity
Heat Added by Refrigeration Compressors
Properties of Refrigerants
Sizing Refrigerant Piping for Air Cond.
Air Conditioning Maintenance Schedule
The Heat Pump
Motor Selection
Motor Terms
Motor Standards
Standard Motor Dimensions
Checklist for Motor Troubles
Selection of V-Belts
Law of Contracts — Essential Facts
Logarithms — Application and Tables
Circumferences and Areas of Circles
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# A NEW Reference Book

**for: Heating Engineers · Estimators · Air Conditioning Engineers · Ventilating Engineers Architects · Piping Engineers · Contractors Plant Engineers · Operating and Maintenance Engineers · Engineering Students.**

# 576 Pages — 317 Essential

**Tables, 193 Charts and Illustrations. The 8½" x 11" page size provides space for large-scale, easy-to-read charts, which eliminate or greatly simplify your calculations.**

## The Scope of the Engineering Databook

Heating and Ventilating's New Engineering Databook is an authoritative reference book providing working data on heating, ventilating and air conditioning for design, installation and operating engineers. Its time-saving tables and large-scale charts greatly simplify everyday estimating and design problems. The table of 175 subjects shown on the opposite page indicates the great variety of practical information you will find in the Engineering Databook. These subjects are grouped under the following eleven main divisions, which briefly illustrate the range covered by this valuable reference work.

1. Heat and Moisture in Air
2. Fuels and Combustion
3. Piping — Sizing, Standards, etc.
4. Air Handling and Ventilation
5. Heating and Heat Transmission
6. Cooling and Air Conditioning
7. Motors — V-Belt Drives
8. What the Contractor Should Know About Contracts
9. Mathematical Tables
10. Drafting Room Standards
11. Terminology of the Industry

## Important Data on Recent Developments

The Engineering Databook is filled with fundamental information, but its overall scope is considerably more than the covering of commonly used data. In addition, the latest information is presented on the important subjects shown in the following list:

**The Heat Pump** — Use of a refrigerating machine for both heating and cooling a building.

**Electrothermal Storage** — Drawing the electric energy from the lines during the night and other off-peak hours, and storing the energy as heat in water tanks, to be drawn on as needed.

**Snow Melting** — Circulation of hot water containing antifreeze through coils embedded under sidewalks, steps, porches, driveways, etc., for automatic snow removal.

**Heating with Diesel Engines** — Heating buildings by the use of heat otherwise wasted in the jacket cooling water and the exhaust of diesel engines.

**Attic Ventilation**—Pointers on proper design and installation of attic fans for cooling residences.

**Heating Water by the Sun** — Data and drawings showing how use can be made of solar heat for heating domestic hot water.

**Radiant (Panel) Heating** — Data on radiant heating by use of buried electric cables, or buried coils containing hot water, making the heating equipment in the room invisible.

**Basementless Buildings**—Authentic data on the calculation of heat losses through concrete slabs on the ground and through floors over a crawl space.

**Axial Flow Fans** — A thoroughgoing discussion on the advantages and disadvantages of axial flow fans as compared with centrifugal fans.

**Estimating for Air Conditioning Units** — Latest short-cut methods for determining the size of unit air conditioners for cooling offices, stores and residences.

**Toxicity** — Latest complete and official data on M.A.C. (maximum allowable concentration) of fumes, gases and dust, for determining ventilation quantities.

## What You Should Know About The Law of Contracts

A most useful and unusual feature of the Engineering Databook is the 18-page section devoted to the law of contracts. This section is based on actual high court decisions which apply specifically to heating, ventilating and air conditioning cases. In this section are discussed: the validity of contracts, implied warranty, technical competence, alteration of plans, extras, subcontracting, substitutions, inconspicuous clauses, guarantees, distinction between employee and contractor, and many other points covered in the law of contracts. Each case used as an example is one in which a heating, ventilating or air conditioning contractor or engineer was involved. In addition, other legal subjects which concern heating men are discussed, such as: patent infringement, real estate law, relations with municipalities, mechanic's liens, withdrawals of bids, and "cost plus" contracts.

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**How Many of the Questions on the Next Page Can You Answer?**

# Do You Know the Answers?

**The sample questions below indicate the comprehensive down to earth character of HEATING AND VENTILATING'S ENGINEERING DATABOOK. You will find the answers to hundreds of questions like these in the DATABOOK.**

Is a "splitter" in a duct elbow of greater advantage with large curve ratios or small curve ratios?

What is the difference between total heat, enthalpy and sigma function of air?

What trouble would you look for with an a.c. motor which runs and then dies down?

The speed of a pump is increased 25% to increase its capacity 25%. Would the increase in horsepower required be of the order of 25%, 50%, 100% or 200%?

Is there a worthwhile saving in insulating the edge of a concrete floor slab in a basementless home?

What air velocities are recommended through the ceiling grille in an attic fan installation?

An exhaust hood is to carry a dangerous fume from a machine operated by a worker 36 inches away. If the air velocity is too low, the fumes will be breathed by the workman, if too high, power costs will be excessive. Can the air velocity 36 inches from the hood be simply calculated?

In general, which has the better adaptability to an installation with a fluctuating system characteristic — an axial flow fan or a centrifugal fan?

If the owner modifies your plans and specifications for a heating system, are you liable for errors?

What is the difference between motors of the following types — varying speed motor, adjustable speed motor, adjustable varying speed motor?

In an Orsat analysis, what would the presence of carbon monoxide with free oxygen indicate?

When would you locate a relief valve on a hot water supply system if it is (a) of the pressure type, (b) of the pressure-temperature type?

Which roof covering would result in the larger load on the air conditioning system from solar heat — one of red asphalt shingles or a red clay tile roof?

How would chemical drying of air be plotted on a psychrometric chart?

What is the objection to a spray pond for cooling water for a refrigeration system?

In a cost-plus contract can the contractor charge for depreciation of equipment?

The dew point of a flue gas is not the temperature at which the water vapor condenses out. What is it?

What range of air velocity should be used in an exhaust system for foundry dust?

What is the purpose of the capacitor in a capacitor motor?

If a contractor manufactures a patented device for his own use is he liable for infringement?

What is the difference between perfect combustion and complete combustion?

Three radiators in the same system are identical except that one is painted with gold bronze, one with white paint, one with brown paint. Which will have the highest heat emission?

What is a simple formula for determining the seasonal fuel oil requirements for a heating plant?

Which pipe most needs insulating because of heat loss — a 3 inch pipe carrying steam at 300 lb. pressure or a $1\frac{1}{4}$ inch pipe with 150 deg. superheated steam at 200 lb. pressure?

How would you determine the number of hours an oil burner would operate in an average heating season in your city?

In combustion, how is the per-cent of excess air determined?

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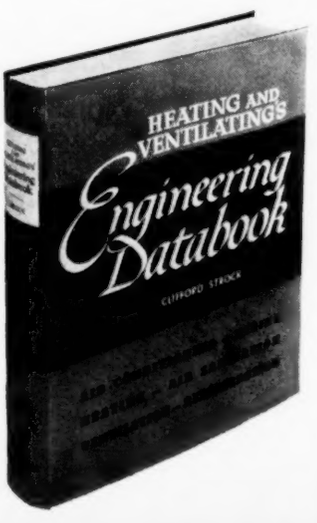


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Model A is a new 6-pole shaded pole motor made especially for driving fan blades.

Outstanding advantages are extreme economy in operation, even, slow-running speed, and quiet performance. Wherever it is necessary to maintain a constant circulation of air, this Alliance Powr-Pakt Motor operating from 1050 rpm down to 500 rpm will do the job.

Mass-produced at low cost Model A comes in various ratings up to 1/30th h.p. and with slight changes in design where quantity warrants.

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4½" O. D. over all. Porous bronze, oilless type, self-aligning bearings — open or fully enclosed construction.

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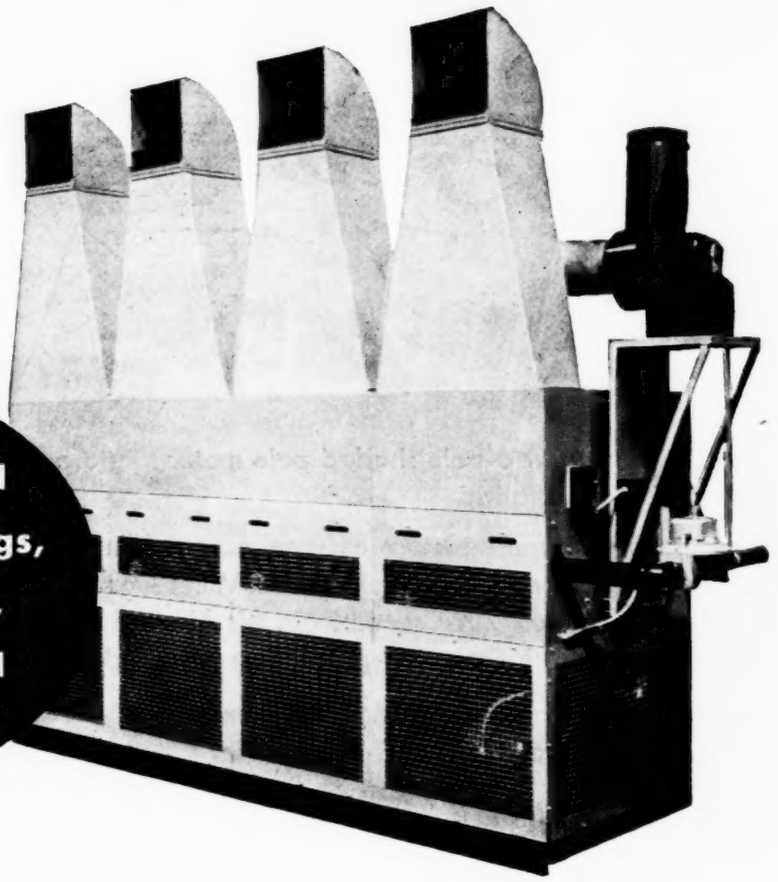


# *Janitrol* heavy duty floor type unit heaters deliver clean, automatic gas heat for the big heating jobs

WHATEVER your requirements . . . for complete direct heating . . . duct distribution . . . supplementary heating . . . or make-up air . . . Janitrol will meet your needs with the following advantages.

(1) Low installation and operating costs.

(2) Quick, clean, automatic gas heat, accurately controlled. Blower for each section assures full, uniform delivery without danger of hot spots.

(3) Compact design requires a small floor area, or units may be placed on suspended platform. Additional heating capacity can be added as heating requirements increase.

(4) Complete Btu capacity range is made possible by the assembly of multiple units. Each unit has an input rating of 250,000 Btu per hour.

(5) Factory assembled and tested to meet rigid specifications.

(6) Backed by the unmatched experience and reputation of Surface Combustion Corporation, for more than thirty years the leading producer of gas-fired heating and heat treating equipment.

If you are planning to build, remodel or expand, write today for complete specifications on Janitrol Heavy Duty Unit Heaters.

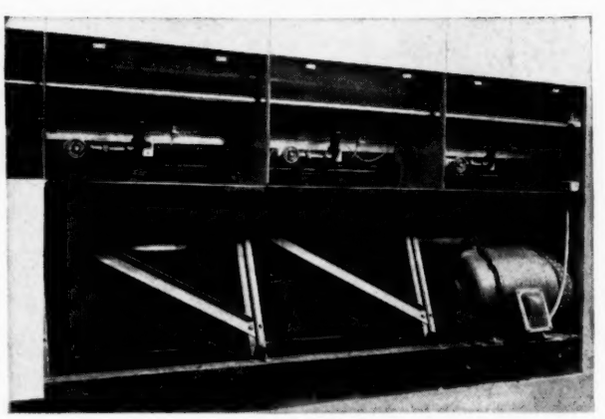


**Photo shows back view of heater with cover plates removed to show motor installation and drive to individual blowers for each section. Note solid base channels, the general rugged construction and solid bracing for maximum strength.**

**SURFACE COMBUSTION CORPORATION**
TOLEDO 1, OHIO

**Janitrol Unit Heaters, both floor and suspension type, equipped with propeller fans or blowers are available in a wide range of sizes with AGA input ratings of 50,000 to 450,000 Btu per hour.**

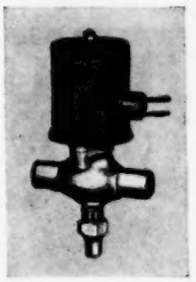
Unit Heater Blower Type
Unit Heater Propeller Type
Unit Heater Heavy Duty Floor Type
Floor Type Blower Unit
Duct-Type Unit Heater

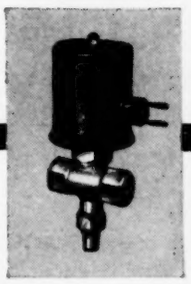
# ALCO

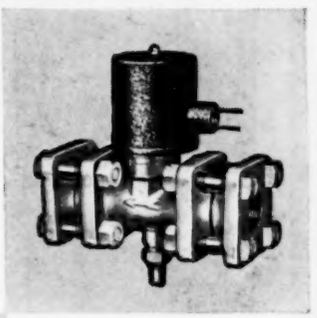
## SOLENOID VALVES
## THE COMPLETE LINE

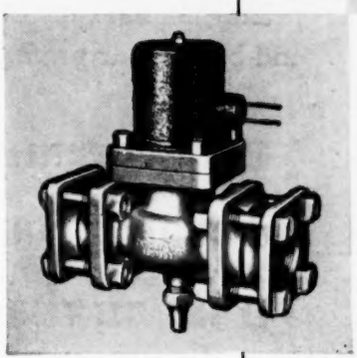
S1

S2


M3


M6


R1


R2, R6

M9F

M5

M8

M915

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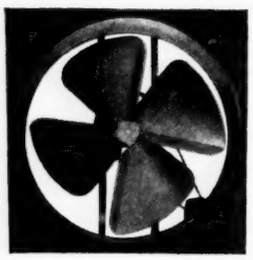
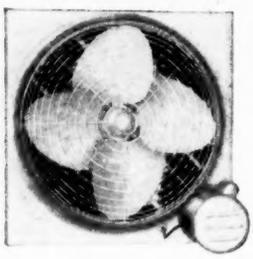


1

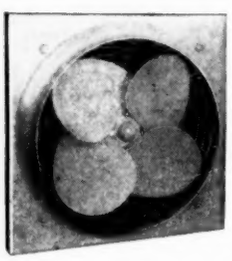
## AIR HANDLING AT ITS QUIETEST BEST

You will need the best there is in quality, performance and design in your merchandise for 1948, and all at a reasonable price. With prices what they are, you must have convincing value to offer. Schwitzer-Cummins Fresh-Air Maker fans and Hy-Duty blowers can't be beat for big air delivery, quiet operation, selling features and looks. You will like everything about them and will cheerfully O.K. this year's prices. And there are a surprising number of essential types and sizes to help you get the business and boost your profits.



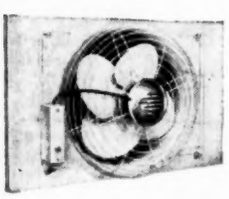
2

- ❶ ATTIC VENTILATORS
- ❷ WINDOW FANS
- ❸ EXHAUST FANS
- ❹ ADJUSTABLE WINDOW FANS
- ❺ PORTABLE CIRCULATING FANS
- ❻ DOUBLE INLET BLOWERS



3

With our enlarged facilities we can now give good service to more dealers and distributors and have some prime territory open. We would like to present a portfolio of new literature descriptive of some very unique and interesting developments for this year's ventilating business. It is yours for the asking.



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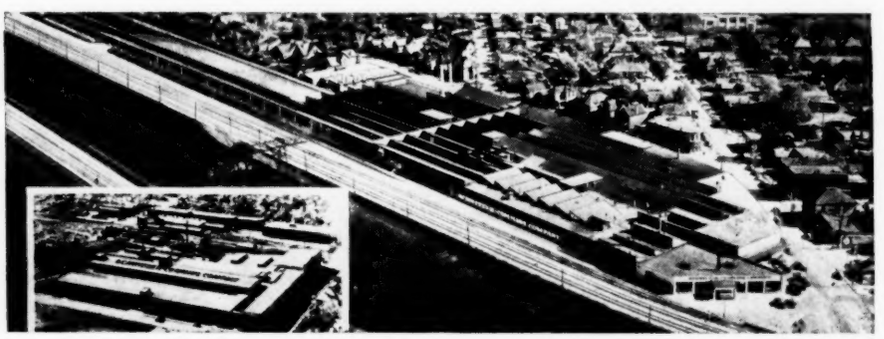

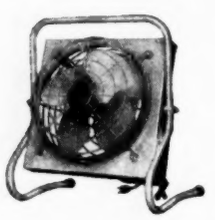

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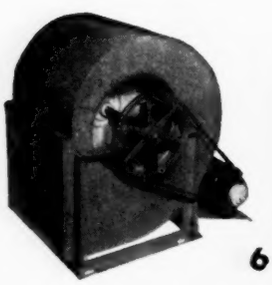

6

**SCHWITZER-CUMMINS COMPANY**
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ENGINEERS AND MANUFACTURERS OF FINE FANS FOR 30 YEARS

# Need a Part like this....

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## It's an ALCOA ALUMINUM IMPACT EXTRUSION

made for Electrol, Inc., Kingston, N. Y.

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Almost any shape that is generally symmetrical can be made as an Alcoa Aluminum Impact Extrusion. Bosses, lugs, wall fins, and other special features are formed integrally at the instant of impacting, with minimum tooling. That's why over-all costs are lower, finish-machining time is less, and design possibilities are almost unlimited.

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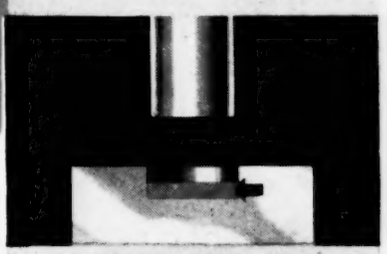
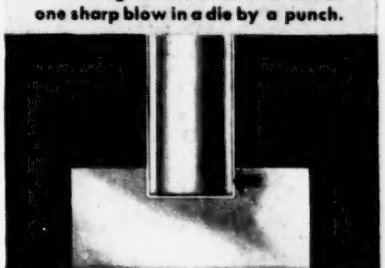
Our salesmen can advise you where and how to use these amazing impact extrusions to save money, machine time, and assembly costs. ALUMINUM COMPANY OF AMERICA, 1471 Gulf Building, Pittsburgh 19, Pa. Sales offices in leading cities.

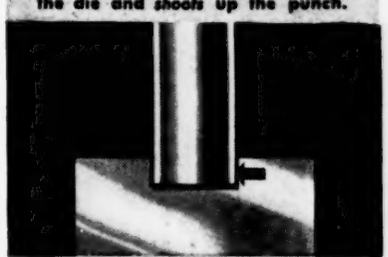
### HOW THEY'RE MADE...



1. A slug of aluminum is struck one sharp blow in a die by a punch.



2. Because the die is larger than the punch, the metal *flows* out of the die and *shoots* up the punch.



3. The space between the die and punch determines wall thickness. The external design features are incorporated in the die, the internal in the punch.

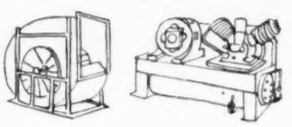
# ALCOA FIRST IN ALUMINUM

1888 — 1948

60 YEARS OF SERVICE

# Here is a picture of vibration

PERHAPS you have never seen such a picture before but you have felt machine vibration and you know how costly it is to stop.

Select a particular make and size of compressor. To isolate its vibration, with any assurance of success, you must analyze all of its vibratory characteristics and then design your isolation accordingly. Of course you can't afford to do that with each machine, but we can, because there are hundreds of other contractors who also want to isolate this same machine. So it goes, on down the line, with all fans and compressors.  We do the engineering for you and for all the other contractors at the same time. Your share of the cost is only a few pennies. We make the bases and units the same way, hundreds at a time and pass the savings on to you. Let us send you complete data and prices and you compare. Just tell us the name of the manufacturer of the machine.

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**10-28 47 AVE., LONG ISLAND CITY 1, N. Y.**

THE Vibration Eliminator COMPANY

**A Better Job**

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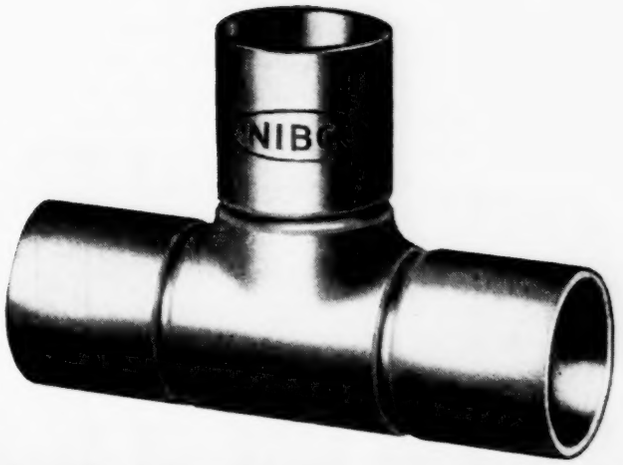


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## WROT FITTINGS

## —for Copper Plumbing

TO INSURE a job you'll be proud of use NIBCO WROT Fittings. They form perfect solder joints—leakproof—stronger than the tube! Easier to work with, too—*the job moves faster because they fit.* Accurately formed to close tolerances under hydraulic pressure, by a patented process.

NIBCO WROT Fittings are available in a complete range of types and sizes. Conveniently packaged and marked for quick, easy identification in time-saving cloth sacks. NIBCO'S uniform quality assures long life, trouble-free service—protects your profits and builds more business. Standardize on NIBCO WROT Fittings for copper plumbing.

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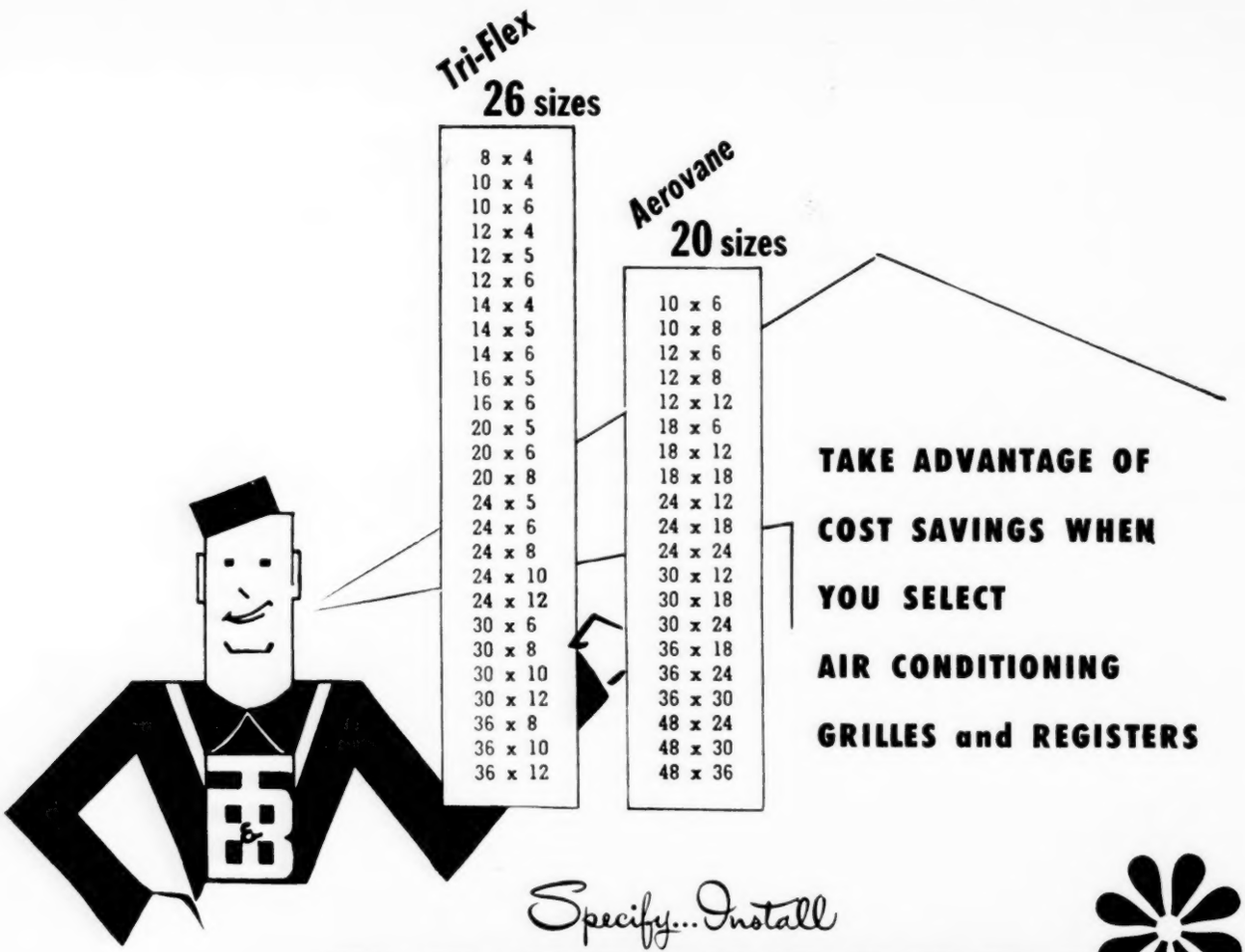
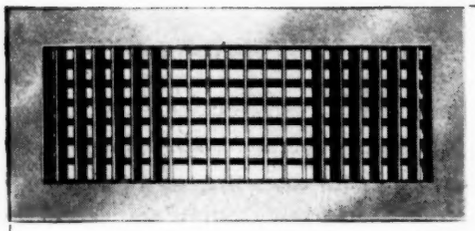



*Specify... Install*

# T&B STANDARDS



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Available as Grille, Double Deflection Grille (shown), Multi-Shutter Register, or Double Deflection Multi-Shutter Register

**Tri-Flex**

**Aerovane**

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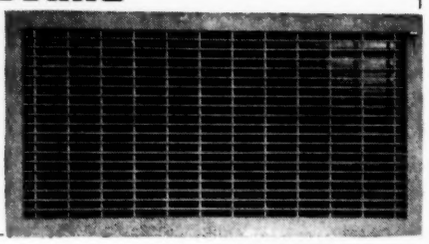

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And there are other advantages. On-the-shelf stock assures quick delivery . . . standardization eliminates guesswork in selecting correct sizes.

For detailed description, engineering data and complete information that will aid specifying and installing, write for a copy of Bulletin 47TF.

## TUTTLE & BAILEY

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STB48

# Washington News

LORING F. OVERMAN

FOR those who plan, direct, and construct the Nation's comfort-conditioning equipment, Washington's February paraded its usual quota of pertinent pointers.

There was President Truman's appeal for both short-term and long-range housing programs.

There was Interior Secretary Krug's try for billions of dollars to start work on a synthetic petroleum production program.

There was a Federal Power Commission hearing of an application to construct another 1800-mile pipeline to carry natural gas.

There was the suggestion of the House Small Business Committee that oil burner manufacturers agree to curtail sales until petroleum production catches up with demand.

The foregoing are but a few of the Washington developments somewhat directly affecting the interests of those who scan this column. Scarcely less important were Washington's curiosity concerning steel price advances, its uncertainty regarding the break in commodity markets, and the likelihood that March will find Congress passing from the talk stage to the action phase of its current session.

### New Tactic

Getting back for the moment to President Truman and the housing program which he introduced to Congress on February 22, it would appear that the Chief Executive is tired of bucking the hostile Congressional line and has called a hidden ball play. In this instance, the play is one that observers say is strikingly similar to an approach scheduled for early appearance in the Senate hopper under the sponsorship of Republican Senator Joseph R. McCarthy. In other words, the President's program embodies most of the points the Republicans had planned to get behind anyway. Thus, it will be most difficult for them to back away after the play has started. The president's proposal cited five objectives:

1. To continue and strengthen rent control.
2. To stimulate a higher volume of home building on a sustained basis, with special emphasis on rental housing and with proper safeguards against possible inflationary effects.
3. To reduce building costs.
4. To assist communities in providing low-rent housing for families in the lowest income groups.
5. To aid cities in rebuilding and modernizing rundown areas.

With the exception of a request for 500,000 public housing units in five years and some features of his rent control proposal, the proposals are closely in line with legislation likely to be sponsored by the GOP-controlled Congress. Toward slum clearance, President Truman adopted the same approach advocated by Senator McCarthy, vice chairman of the Joint Committee on Housing. The committee conducted hearings throughout the country during the Congressional recess, and Senator McCarthy is writing the over-all bill embodying the committee's recommendations.

Mr. Truman agreed that major expenditures for slum clearance should be deferred at present, leaving such projects as a bulwark against depression. This proposal is being written into the McCarthy bill, as is a Truman suggestion that local authorities should supplement Federal funds in slum clearance projects. Commenting on the President's proposals, Senator McCarthy agreed they were "good", and added that his message had removed most of the housing problems from the field of partisan politics.

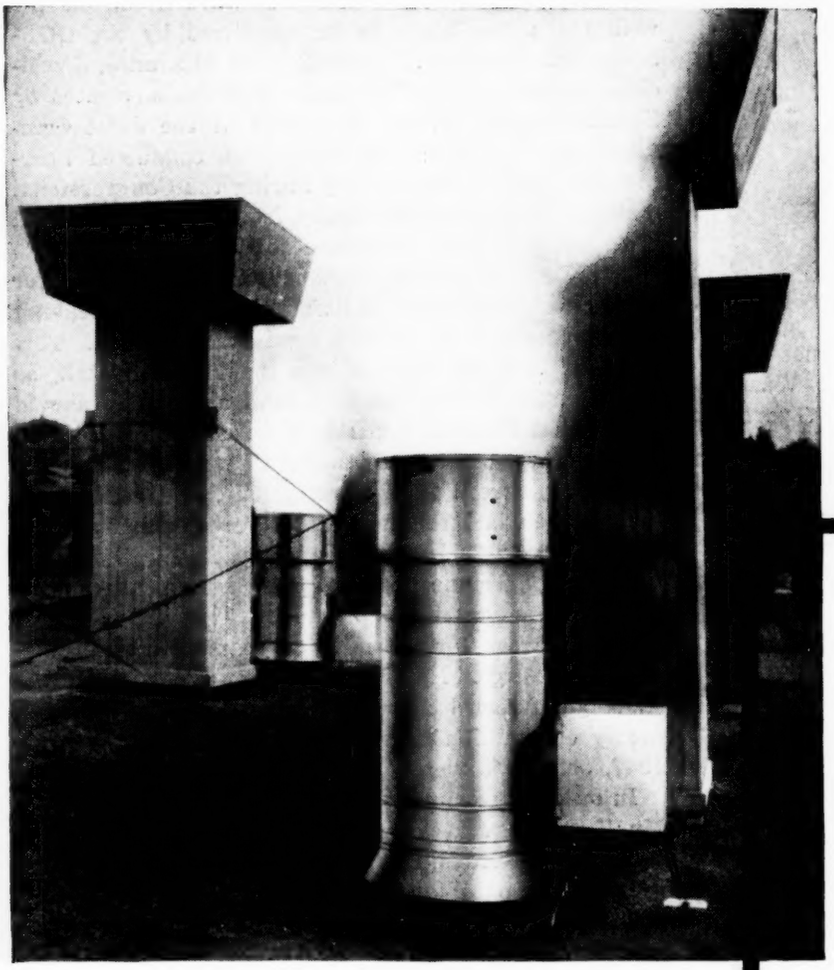
President Truman called for an annual average of more than one million new houses and apartment units in urban areas for the next 10 years, and additional rural dwellings. He laid special emphasis upon the shortage of rental housing, pointing out that although nearly one million housing units were constructed in 1947, only 15% were for rental purposes.

In order to stimulate the building of rental housing, Mr. Truman said, Congress should extend Title VI of the National Housing Act for one year, with an increase of two billion dollars of insurance authorization. This is understood to be a feature of the McCarthy proposal.

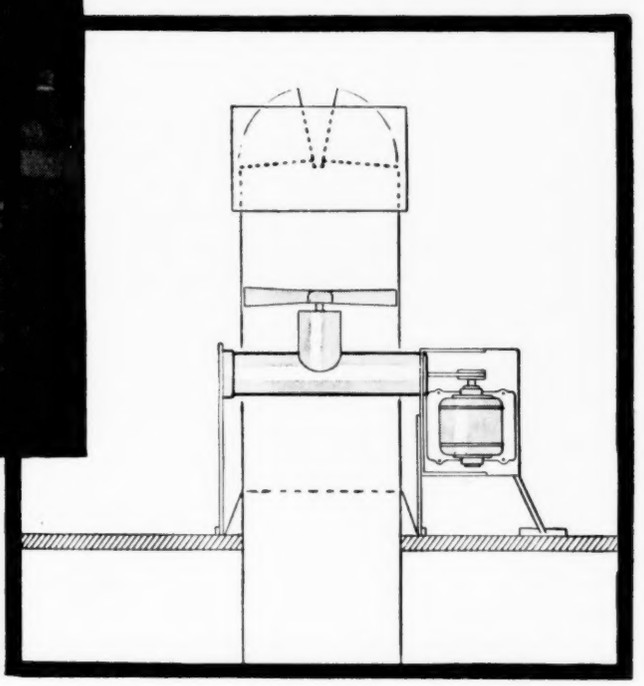
The President also asked that the basis for insuring loans be made more liberal on housing built for rent. The McCarthy proposal bases insurance authorization for sale property on its long term value; for rental property on current costs. In addition, the McCarthy measure will provide for complete income tax exemption for direct investment in very low-cost housing, and for other investors a 50% depreciation for income tax purposes for the first five years.

At variance with GOP-sponsored ideas was the President's request for authority to allocate materials in short supply, but in most other instances, his proposals are conceded excellent chance of passage. Included are proposals for Government-sponsored research into building materials, building methods, and reform of building codes. Also proposed by the President, and in process of preparation on the Hill, were recommendations that Congress make special provision to insure loans to housing cooperatives. McCarthy is drafting legislation to provide long term, low interest loans to housing cooperatives, particularly veterans' groups.

Inasmuch as the Truman-McCarthy proposals voice substantially the recommendations of the Joint Senate-House Committee on Housing, the measure may develop as a substitute for the controversial Wagner-Taft-Ellender housing bill. This bill has twice failed of passage, but with many of its provisions incorporated into the McCarthy bill, which is proposed as an overall solution to a housing problem that has proved most difficult to cope with. The latter bill promises to be the one to watch.



# HERE'S HOW TO HANDLE FUMES



● In this dye-house installation by Wolverine Equipment Company, Cambridge, Mass., two belt-driven Propellair fans, exhausting corrosive fumes through stainless steel stacks, are doing *a far better job* than did *four* older-type ventilators. Fan blades and belt housing are covered with corrosion-resistant coating. A water-tight stainless steel duct, from the stainless steel dye kettles, carries air to roof exhaust fans. Diagram shows belt-driven drumless-type Propellair installed in stack. Can be inserted in any duct or pipe through small openings, without disassembly of either duct or fan.

## PROPELLAIRS KEEP THE AIR CLEAR

Air movement by Propellair is the quick, *sure* way to remove dust, toxic fumes, moisture, heat. Fair weather or foul, Propellairs clear the air and *keep* it clear. They *improve* working conditions—*reduce* labor turnover—*increase* efficiency.

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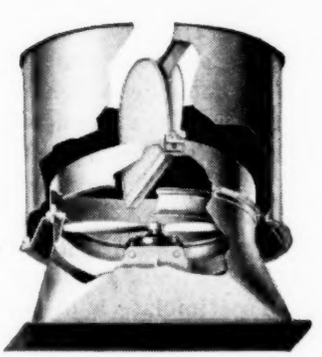
Propellair types and sizes meet all needs for air intake and exhaust, and for distribution of conditioned air. Made for walls, roofs, windows, ducts, hoods, stacks, and with pedestals or stands. Fan blades and entrance rings utilize the *airfoil principle* for high-volume, *low-cost* air movement. Motor can be either in or out of air stream. Maintenance is negligible. Plants everywhere find Propellairs *just what they need* to help keep production figures *high.* You'll find them helpful, too. For application advice, call in your nearby Propellair specialist, or write for free descriptive literature.



*Propellair Verti-Stack Power Roof Ventilator for standard installations.*

PROPELLAIR DIVISION OF ROBBINS & MYERS • INC.
SPRINGFIELD • OHIO
"Moving Air is our Business"

### Synthetic Oil

As to Interior Secretary Krug's request for action on a proposal to explore the synthetic oil resources of the Nation, this was timed for presentation when the weather was its coldest, and the oil shortage was noticeable.

There appears little likelihood that Congress will rush to the front with the billions of dollars required, but everyone admits the appeal was well timed. Congress can no longer take the petroleum situation lightly. Net result of the Krug appeal will probably be an appropriation to continue experimental work, and greater appreciation of the petroleum industry's problem of securing maximum production under current conditions.

### Burner Curtailment Urged

How seriously Capitol Hill regards the oil shortage is indicated in a report released February 22 by Chairman Ploesner of the House Small Business Committee, recommending that manufacturers of oil burners and space heaters agree to curtail sales until the fuel oil supply catches up with demand. The report recited that the expected demand for oil products in 1948 is 6,200,000 barrels a day. The domestic production, with the industry operating at top capacity, averaged 5,325,000 barrels daily as of January 18, leaving a deficit to be supplied by imports or new production.

Contributing to the fuel oil shortage in mid-western States, the committee suggested, was the installation of 283,053 new oil burner units in the 12 States during 1947.

### New Pipeline Urged

Further discussion of the fuel situation went into the record on January 19, when a Federal Power Commission Examiner, Edward B. Marsh, heard proponents of a proposal to build a new natural gas pipeline running 1800 miles to the Atlantic Seaboard, to carry 325 million cubic feet of gas a day. The Commissioner was told by Donald Linton, Boston, market analyst, that during the next five years 26 trillion cubic feet of natural gas must be located to maintain the nation's reserves at current levels.

George A. Lamb, Pittsburgh, Pa., fuels economist, testified that petroleum production appeared to have reached its maximum. The Nation will be fortunate, he said, if the present rate of production can continue many more years, leading to growing dependence on natural gas and coal for fuel oil and gasoline.

Witnesses also described the extent and condition of the great Hugoton natural gas field in Kansas, Oklahoma and Texas, source of much of the natural gas now piped into the East. The Panhandle field, witnesses said, will reach its production peak between 1954 and 1965, while the Hugoton field will hit the peak by 1963.

Construction of the pipeline is opposed by railroads, some oil companies, coal producers, and some labor unions. Representatives of all these have appeared since occasional hearings started on October 27. Opponents of the pipeline have contended that a high quality motor fuel can be produced from natural gas at 2 cents a gallon less than gasoline refined from petroleum. They have estimated that 14,000 barrels a day could be produced from plants already under construction, and that eventually 500,000 barrels a day could be taken from this source.

Another contention they have advanced is that much natural gas is "dumped" by selling it for use in industrial boilers to take up the slack during the summer when domestic and commercial demand drops. As a result, they say, winter peak use by domestic and commercial purchasers cannot be met, and a shortage of gas for one customer or another is inevitable.

### Uncle Sam as a Customer

Speaking of customers, the world's biggest customer, Uncle Sam, with $40 billion or so to spend, and with his credit still okeh, has changed some of his buying rules. Those who sell to him, or plan for him, will be interested. Under the new Byrd law, now effective, Uncle Sam is now permitted considerable latitude in selecting suppliers, and he may buy without bids and advertising, in the following situations:

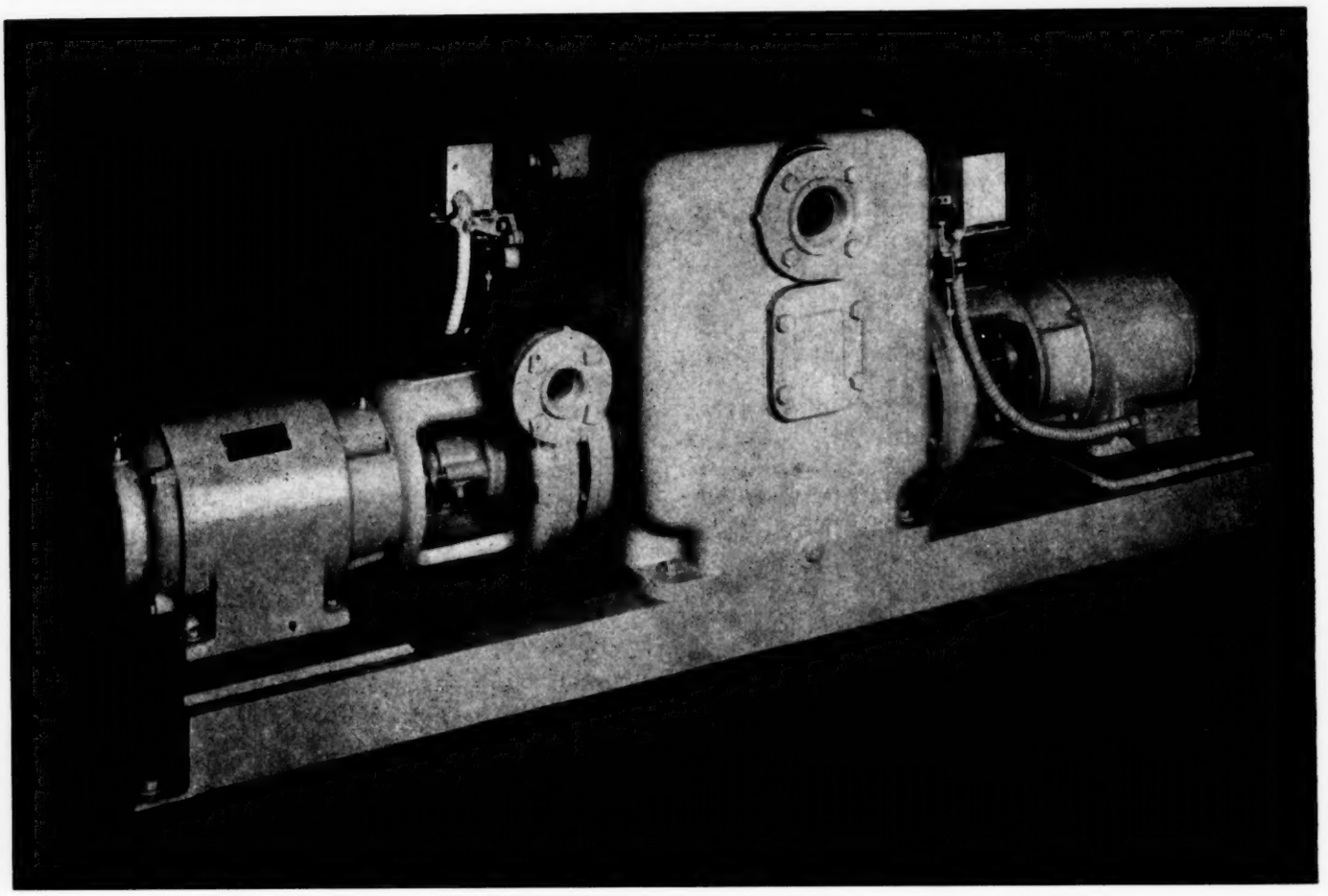
—where the amount of the purchase does not exceed $1,000.
—medicines, supplies for resale, perishables, subsistence supplies, and so on.
—where the contract is for experimental, developmental or research work.
—where it is important that the nature of the contract remain secret.
—where competitive bids are impracticable.
—where standardization of equipment and interchangeability of parts is necessary.
—where a substantial initial investment or special preparation is required before the order can be filled.
—where an educational order is given to keep production going in anticipation of an emergency.

Because of Uncle Sam's new appreciation of the importance of air conditioning and refrigerating equipment, the change in this big customer's buying habits may become important to the industry. Small companies may be particularly interested, since the law specifies that they be given special consideration. For details, fill out a new special form, TS 705 revised, obtainable from the Deputy Director, Purchase Branch, Bureau of Federal Supply, Seventh and D Streets, S.W., Washington 25, D. C.

### Congress Rubs Hands

Indirectly affecting all H&V readers is the indication that Congress is rolling up its sleeves with the idea of making March lead off a series of "action" months, to supplement the "talk" period which started in January. Early action on the European Recovery Plan is forecast, with approximately $5.3 billion as the probable "investment" for the next 12 months. Also likely is some assurance that the plan will continue for four years, if needed.

# MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



**JENNINGS CONDENSATION PUMPS**

Designed for steam systems on heating, drying, or process work, these pumps offer the most reliable and efficient means of returning hot condensate to boiler or hot well. In many cases these pumps will save costly installation of boilers in a pit to provide gravity flow of returns from basement radiators and heating devices.

The Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Pumps are bronze fitted throughout, with tobin bronze shaft. The pumping impeller is of special design, made possible by our wide experience with return line heating pumps, and is especially adapted for handling hot water with the greatest possible efficiency.

Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

## THE NASH ENGINEERING COMPANY

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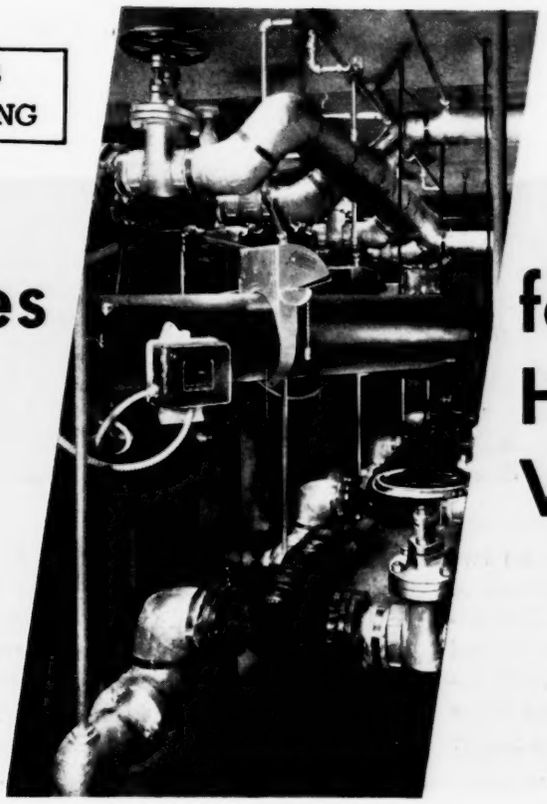
HEATING AND VENTILATING

# Valves for Heating and Ventilating



RICHARD IRMITER

Crane Co., Chicago, Ill.

**Basic design details of valves commonly used in heating and ventilating installations.**

ANY equipment installation involving piping will call for valves as one of its most important requirements. Wherever a fluid or gas flows through a pipe, at least one valve is needed to control the flow. Most piping installations require several or many valves, often of a dozen different types. Presented here is basic information on the types of valves most used in the heating and ventilating industry. It is, of course, admitted that there are a great many special types of valves that cannot be touched upon in the scope of this article, for many of them would require separate articles in order to adequately describe their applications and purposes. We cannot hope to cover each basic type more than briefly—applications of globe and gate valves are so numerous, for example, that a discussion of each use of the valves would be impossible. It is our hope in preparing this article to point out certain specific advantages in the various basic designs, thereby aiding in valve selection for specific installations.

## Gate Valves

Gate valves, Fig. 1, are used where flow must travel in a straight line with as little restriction as possible. The disc in a gate valve moves up and down at right angles to the path of flow, between two perpendicular or slightly tapered seat rings against which the disc is seated to shut off flow. Gate valves have all-metal discs, and disc travel is actuated by the stem screw. The straight-through course of flow in a gate valve reduces pressure drop to the minimum for liquid lines, pump lines, and main supply lines, in which unrestricted flow is usually required. Gate-valve design is not practical for throttling services. The velocity of flow against a partly opened disc may cause vibration and chattering, resulting in damage to the seating surfaces. Moreover, the disc of a throttled gate valve is subject to severe wire-drawing erosive effects at the lower edge. There are two main types of gate valves, the wedge and the double-disc. A third type, a combination of the two—the double-wedge disc valve—also is available. The tapered disc of the wedge gate wedges in between two seats when the stem is down, closing the valve. Like the wedge disc, the

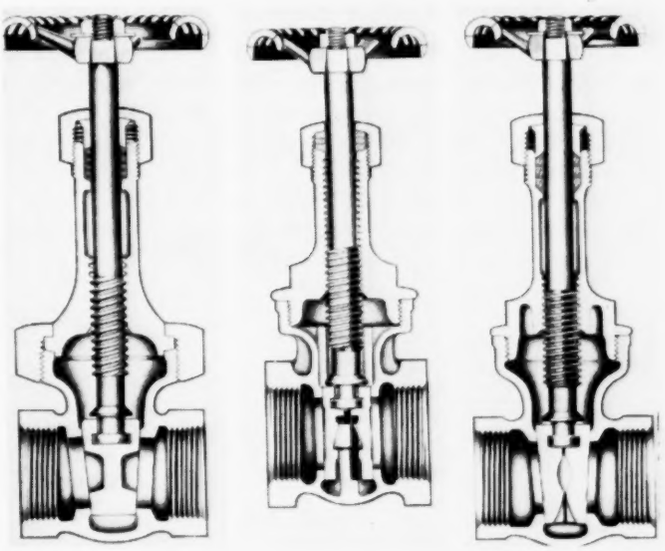


Fig. 1. Types of gate valves. Left, wedge gate; center, double disc gate valve; right, double disc wedge gate valve.

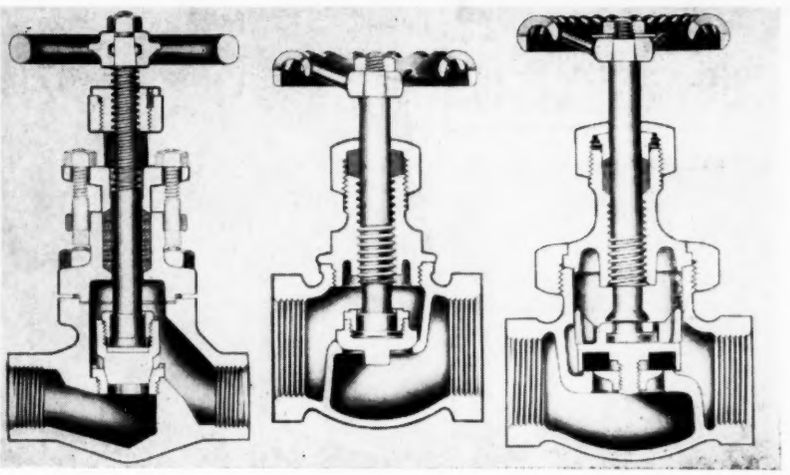


Fig. 2. The three general types of disc design used as part of globe valve construction. Left, plug type disc; center, conventional beveled metal disc; right, globe valve with composition disc. Globe valves are so designed that discs and seats can be quickly and easily reground or replaced.

double disc makes closure by descending between two perpendicular seats in the valve body, but instead of wedging between the seats, its parallel faces after being lowered into position, are seated by being spread against the body seats. A disc spreader is used between the two halves of the disc. When the valve closes, the spreader makes contact with a stop in the bottom of the body and forces the discs apart.

Double-disc valves are easier to operate, and are simple to service on the job. The wedge disc valve is simpler in design, and has no loose internal moving parts. Where gate valves cannot be installed with stems pointing upward as is usually recommended, the wedge disc eliminates the danger of disc jamming, which has been known to occur in double-disc valves. Discs may be replaced without removing the valve from the line. To replace a disc in a wedge-disc valve, necessitates removing the valve to a repair bench, and "lapping" the new disc to match the valve seats. Wedge discs are particularly recommended on steam lines, double-disc valves being prone to vibration and noise in this type of service. Double-disc valves are widely used in non-condensing gas and liquid services at normal temperature.

### Globe Valves and Angle Valves

Globe valves, Fig. 2, change the direction of flow of the fluid passing through the valve body, resulting in a greater resistance to fluid movement. But the construction of these valves makes them ideally suited for throttling service, where flow regulation is necessary. Short disc travel in globe valves saves operator's time when valves must be operated frequently.

Globe valves have three general types of disc design —the conventional beveled metal disc, the plug-type disc, and the composition disc. These valves are easily serviced, and discs and seats can be quickly and conveniently reground or replaced. This feature makes globe valves desirable for service necessitating frequent valve maintenance. Globe valves are always used on by-passes around pressure regulators and around traps.

Angle valves have the same operating characteristics as globe valves and are available in a similar range of disc and seat designs. Used when making a 90-degree turn in a line, an angle valve reduces the number of joints and saves make-up time.

Specially designed motor-operated and solenoid-operated globe valves are available for use in large installations where it is desirable to supply hot water or steam to various branches independently, such as in large buildings where the heating demand from different sections may vary considerably.

Radiator valves, Fig. 3, are a special type of globe or angle valve made for use on steam or hot water radiators. They are usually made with composition discs, although some are sleeve-type valves. All radiator valves are equipped with non-heat-conducting handles. Some radiator valves are made with brass discs, for use with high-pressure steam. Steam and hot water radiator valves are usually interchangeable,

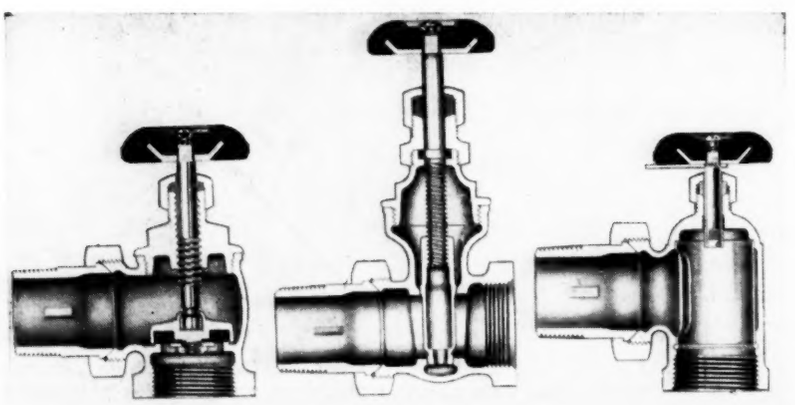


Fig. 3. Special type of valve used for radiator service. Left, composition disc steam radiator valve; center, radiator gate valve with wedge disc and non-rising stem; right, hot water radiator valve. All types are provided with non-heat-conducting handles.

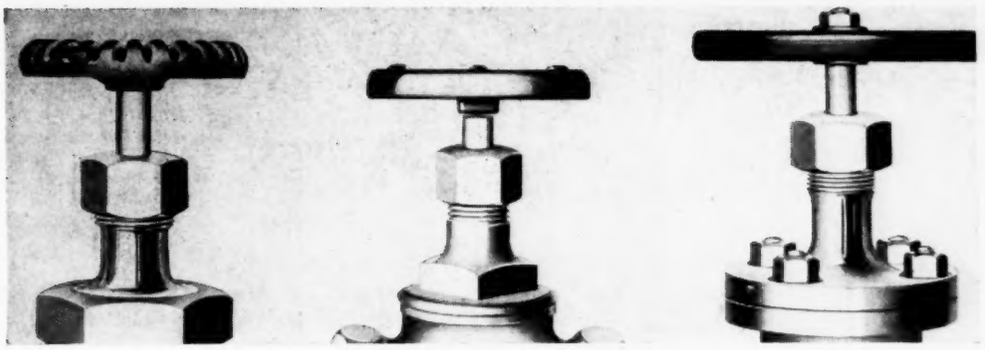


Fig. 5. Left, union ring bonnet; center, screwed-in bonnet; right, bolted bonnet.

except that when the valves are used in hot water service a small hole is drilled in each valve seat to allow slow circulation at all times, a safety precaution against freezing.

It must be kept in mind that globe valves offer higher resistance to flow than gate valves, and also that, under certain conditions, globes may prevent complete drainage of pipe lines—a particularly important point in heating installations.

### Conventional Disc

Before the development of the plug-type disc, the conventional disc valve was considered best for the toughest services. Main advantage of the conventional disc design is the ease of obtaining a pressure-tight bearing between the disc and seat. This is achieved by the thin line contact between the tapered seat and the face of the disc. This thin line bearing also helps to break away hard deposits that form on the seat in some types of service. The conventional disc is made in several seating styles, such as flat seating, ball seating and with seating surfaces having various degrees of taper. Conventional disc valves are recommended for many cold and temperature services under moderate working conditions.

### Plug Type Disc

The long, tapered plug type disc and matching seat represent one of the latest advances in valve engineering. The wide bearing surfaces offer highest resistance to the cutting effects of dirt, scale and other foreign matter present in pipe lines. This feature makes plug type disc seating the best choice for toughest flow control service. Plug type disc valves are made in globe and angle patterns, and are highly recommended for service such as drip and drain lines, soot blowers, blow-off, boiler feed and other severe services. They are available in a wide variety of disc and seat materials to meet specific needs.

### Composition Disc

The composition disc works on the principle of a cap. The flat of its face is seated against the opening in the bridge wall. The disc unit consists of three parts, metal disc holder, composition disc, and retainer nut. The main feature of the composition disc is the variety of disc material available for individual services, such as air, steam, hot and cold water, oil, gas, gasoline and other fluids. These valves can be quickly changed over from one type of service to another, and when leakage occurs, discs are readily renewed. The composition disc is suited to all types of service, except throttling, at moderate pressures and temperatures up to 400F. The composition disc is subject to the cutting effects of foreign matter, but it will stand much embedding of dirt before it leaks. When leaks develop, the valve discs should be renewed immediately.

### Stem Operation and Bonnet Types

Stem and bonnet construction, Fig. 4 are important factors in the selection of valves, since they influence the general behavior and performance of valves, and help meet maintenance requirements of given installations. For the gate and globe valves there are three common types of stem designs. Operation of all is based on the screw principle, the main differences being in whether or not the stem rises out of the valve, and whether the stem screw is inside or outside of the valve body.

The bonnet of the valve is that part which provides a fulcrum enabling the stem to move the disc up and down. Because the bonnet is under pressure when the valve is in service, a pressure-tight connection is

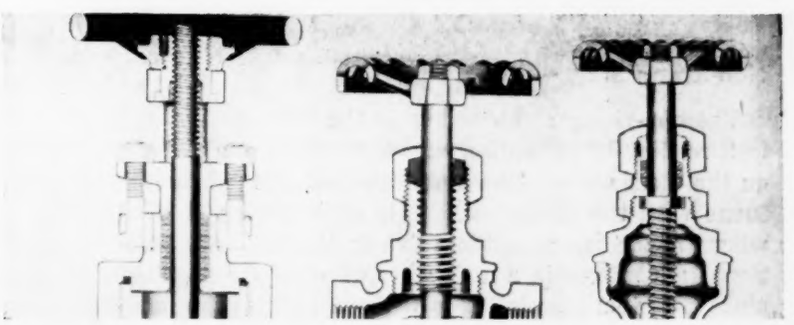


Fig. 4. Three common types of stem design for gate and globe valves, all based on the screw principle. Left, rising stem with outside screw which frees the outside screw from exposure to line conditions. Center, rising stem, inside screw —the commonest type of stem construction. Right, non-rising stem, inside screw, used with gate valves.

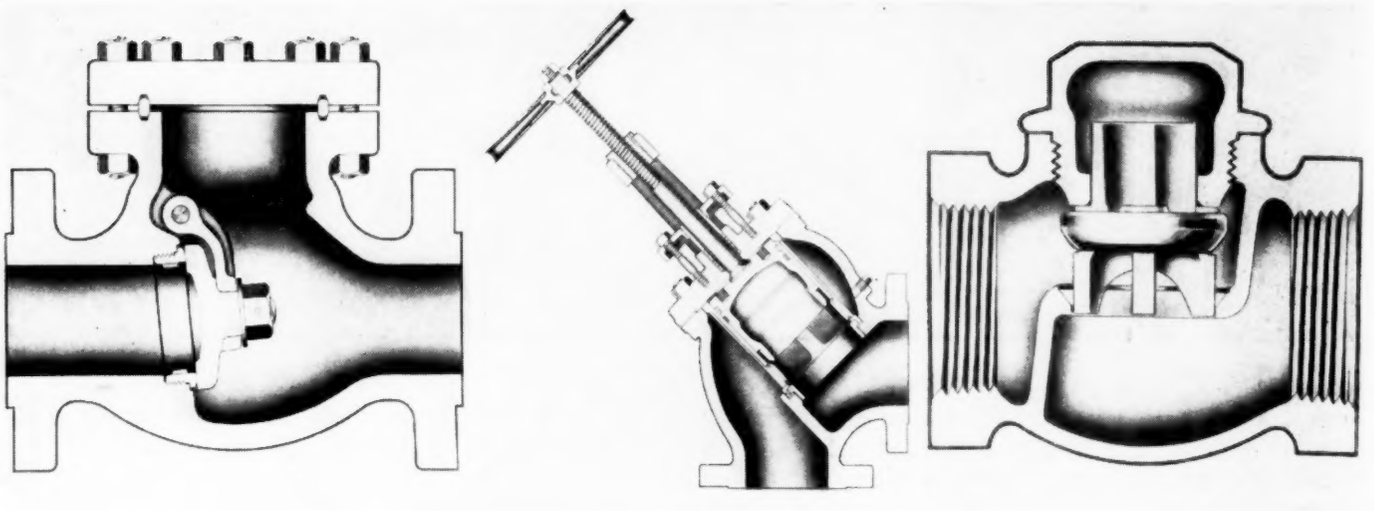


Fig. 6. Left, swing check valve; center, stop check valve, angle Y pattern; right, lift check valve.

necessary between the bonnet and the valve body. To provide the type of construction most adequately suited to various service needs, several types of body-bonnet joints are used—screwed-in, union-ring and bolted bonnet.

More specific descriptions of the various stem and bonnet designs follow:

### Rising Stem – Outside Screw and Yoke

In one variant of this type, the handwheel rises with the stem; in the other the handwheel is fixed vertically, and, as the handwheel turns, the stem rises through it. The stem screw remains outside of the valve body, whether the valve is opened or closed. With this type of valve, the outside screw is free from exposure to line conditions in steam and high-temperature service. This design also permits easy lubrication of threads. The rising stem shows the operator at a glance, the position of the valve disc. A precaution to take in the installation of this type of valve is to provide adequate headroom for operation. Stem thread must be protected against damage when raised.

### Rising Stem – Inside Screw

In this type the stem screw engages threads inside the bonnet, and the stem and handwheel rise above the valve when the disc is raised. This is the commonest type of stem construction used. Lubrication is accomplished through the packing chamber. With this construction also, the position of the stem indicates to the operator the position of the disc. Headroom must be provided for valve operation.

### Non-Rising Stem – Inside Screw

The non-rising stem rotates in the valve bonnet and is threaded into the disc, which travels up and down on the stem screw. The stem does not rise; it merely turns with the handwheel. This construction is ideal where headroom over the valve is limited. An additional advantage is a reduction of wear on packing, since the stem merely turns without rising. The non-rising stem is used with gate valves only. It is suited for all services where there is no objections to the stem being exposed constantly to flow. The position of the disc cannot be seen outwardly. Valves may be equipped with external indicators, however, to show open and closed positions.

### Screwed-In Bonnet

Simplicity is the principal feature of the screwed-in bonnet. This is the most common construction for small, low-pressure gate, globe and angle valves, its strength factor being adequate for such service. This valve is readily dismantled, but the screwed-in bonnet is not suitable for installations requiring frequent opening of the valve body. This construction is not recommended where vibration, shock or other stress conditions are present. Such conditions may strain and distort the valve body, making it impossible to keep the joint from leaking.

### Union Ring Bonnet

In contrast with the ordinary screwed-in bonnet, the union ring joint type, Fig. 5, permits frequent opening with comparative ease. The union ring gives added strength and rigidity to the body against internal pressure and distortion. This type of valve is ideal for service requiring frequent inspection and cleaning of internal valve parts, and for quick servicing of composition-disc valves. Its use is restricted to smaller valves by the limitations of practical construction and maintenance.

### Bolted Bonnet

The bolted bonnet, Fig. 5, is most practical for high working pressures and temperatures. It is more rugged and sturdy than any other common bonnet type. An important feature is its adaptability to all types of gasket joints, ring or flat face, giving equalized gasket pressure by its multiple bolts. When dismantling is necessary, bolts are easily removed with a small wrench.

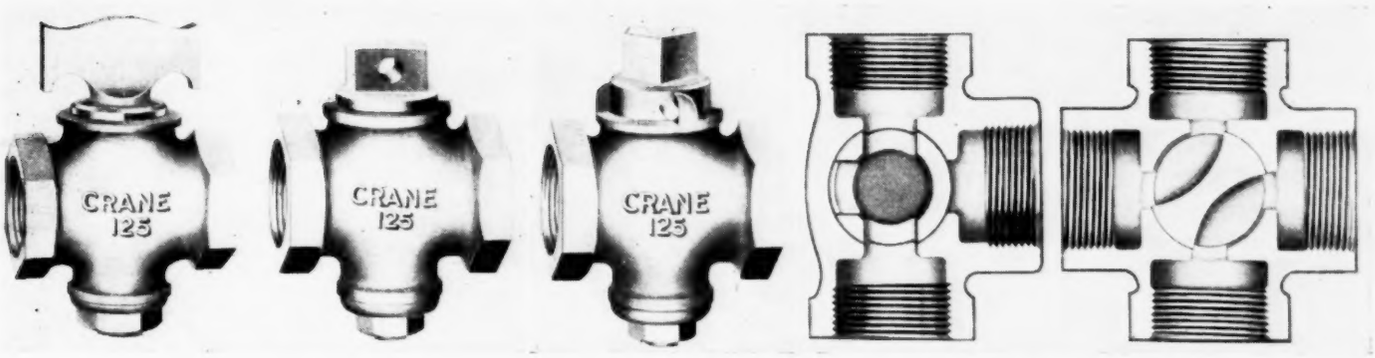



Fig. 7. Types of cocks illustrated are from left to right, cock with T-head, cock with flat head, cock with square head, cross sections of 3-way cock, and 4-way cock.

Another bolted bonnet type of valve is the clamp type. This valve is taken apart by loosening two bolts, which makes the valve particularly adaptable to installations where frequent inspection and cleaning of lines is necessary.

### Check Valves

Check valves, Fig. 6, used to prevent back flow in lines and as flow control valves in hot water heating systems, are made in two basic types—swing and lift.

### Swing-Check Valves

With the basic swing-check design, flow moves through the body in a straight line. This is comparable to a gate valve. Similarly, this type of valve gives less resistance to flow than the lift-check valve. In the swing-check unit a slightly tilted bridge wall crosses the line of flow; and the disc, which is hinged at the top, seats against a machined seat in the bridge-wall opening. The disc is free to swing on its hinge pin in an arc from fully closed position to a position parallel or almost parallel with the flow, thus permitting full flow. Flow keeps the valve open, the size of the opening varying in direct relation to the volume of flow. Gravity and reversal of flow seat the disc automatically. Swing-check valves are recommended for use with low or moderate pressures. For years, it has been a general rule to use swing-checks in combinations with gate valves. However, it is wise to consider each application individually.

Swing-check valves are furnished with regrindable metallic discs and with leather-faced discs, the latter mainly for use in water lines. These valves are available with bolted or screwed caps. Every swing-check must be installed so that the disc is held to the seat by gravity.

Recommended where quick closing of disc with reversal of flow is necessary, is the outside lever and weight type of swing-check.

### Lift-Check Valves

Lift-check valves hold more tightly than swing-checks. To insure proper seating, the disc is equipped with a short guide stem, usually above and below, which moves vertically in integral guides in the cap and bridge wall. Flow through this valve follows a turning course through the horizontal bridge wall on which the disc is seated. The disc is seated by backflow, or by gravity when there is no flow, and is free to rise and fall, depending upon the pressure under it.

The general rule on using lift-checks is to put them in lines in which globe valves are used. They are recommended for water, steam, air, gas and general vapor service. Their construction makes them better able to stand the punishment of high velocity flow than the swing-check type. Lift-checks are made in globe, angle and horizontal patterns, with screwed, union ring or bolted caps.

### Stop-Check Valves

The automatic stop-check valve was designed specifically for use in steam lines between multiple boilers and headers. Such a valve should be installed in each pipe line from each boiler to the main header when more than one boiler is connected to a header. This valve acts as a safety feature, preventing steam backflow from the header into the boiler in the event of boiler failure or in the event of a boiler shut-down for inspection or repair. When a boiler has been shut down, the stop-check valve serves to cut the boiler back into service as it is brought up to pressure again, by automatically opening up when the boiler pressure is slightly above header pressure. This is accomplished smoothly, without pressure fluctuation or disturbance of water level.

The stop-check also can be manually operated, so that a boiler can be positively cut out of service. In the event that it is desired to bank the fires on several or all of the boilers in an installation without shutting them down completely, it may be desirable to close the stop-checks manually, so that boiler pressure cannot force steam into the main line. This is done frequently, for example, when it is necessary to work on the gate valve in one of the boiler lines between a stop-check and the header. Once the valve has been closed manually, it cannot be reopened except by boiler pressure. There is no connection between the disc and the valve stem. When the stem is raised by the handwheel, the disc remains in place.

Automatic operation of the valve is accomplished in much the same manner as for a conventional check valve. The stop-check has a piston type disc that is free to move within its liner unless the manually oper-

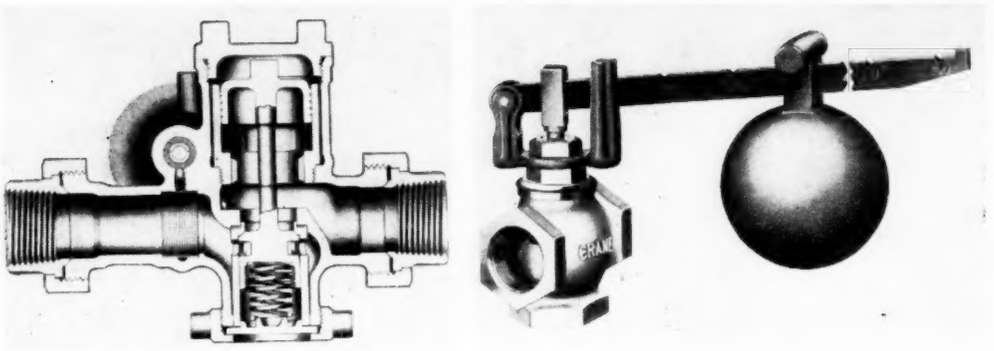



Fig. 8. Left, spring operated type of pressure regulator; right, lever and weight type safety valve.

ated stem is screwed down for complete shut-off. When the boiler is in operation, with steam flowing, the steam pressure holds the disc off its seat. When boiler pressure drops below line pressure, or when the boiler is shut down, the disc drops into place, automatically shutting off backflow from the line.

### Cocks

Cocks are the simplest type of valves manufactured, conventional types consisting only of four parts: body, plug, nut and washer. Conventional cocks, Fig. 7, are designed with square, flat or T-type operating heads, or with lever handles. Some are furnished with removable key type handles or removable T heads.

Cocks are designed for two-way, three-way and four-way use. Some have tapped drains for draining the line in which the cock is used. The sharp taper in the plug makes it possible to create considerable wedging friction when the cut is drawn up, so plugs are usually lubricated to keep the cocks easy-operating. Care has to be taken in drawing up the nut; it must not be so tight as to cause the plug to jam, or so loose as to cause leakage.

Cocks are used on hot-water heating systems to balance the flow of hot water to branches of the system, so that the various areas can be heated equally. Cocks are also frequently used as boiler drain valves and as drain valves in other places that need draining only at long intervals.

### Pressure Regulators

When high-pressure steam is supplied, one or more pressure regulators, or pressure reducing valves, are required for reducing steam pressure to usable limits for room heating, domestic hot water and utility services. Pressure regulators, Fig. 8, are made in three general types: spring-operated, ball-type and weight-and-lever type. In a pressure-regulator valve, a portion of the high-pressure steam is admitted to a diaphragm chamber, deflecting the diaphragm so that an auxiliary valve, which in turn admits steam pressure to a piston chamber, is closed. When the auxiliary valve is opened, the pressure on the piston opens the main valve, allowing steam to enter the line. When the auxiliary valve closes, steam is cut off to the piston, in turn cutting off steam from the line. The diaphragm is controlled by an adjustable spring or a weight-and-lever arrangement, which allows an adjustment of the amount of steam allowed to enter the line. The cycle of operation is very rapid (almost instantaneous), and adjustment of the diaphragm, either by a spring or by a weight-and-lever arrangement, determines the amount of steam that is allowed to enter the line. Delivered steam pressure can be controlled with considerable accuracy, even when there are variations in the main supply pressure.

In another type of pressure regulator there is no auxiliary valve, the steam flow valve being controlled directly by the diaphragm. This type of valve can be had both in the ball type and the disc type. Diaphragm control is accomplished by a spring mechanism, by a weight-and-lever arrangement or by air under pressure behind the diaphragm.

Pressure regulators are used two in series where pressure drop exceeds 100 lb per sq in. (50 lb per sq in. where cast-iron radiation is used), to make steam flow quieter. This also furnishes an additional safety factor, should one reducing valve build up its discharge pressure. Installation of two pressure regulators in parallel is common practice where steam requirements are heavy and variable in milder weather. These are usually selected so that one can handle 70% and the other 30% of maximum capacity. The small valve is set at a somewhat lower pressure than the larger, so that it is inoperative when steam requirements are below 70% of maximum. In mild weather, when requirements are down to or below the capacity of the smaller valve, the feed line with the large valve is shut off.

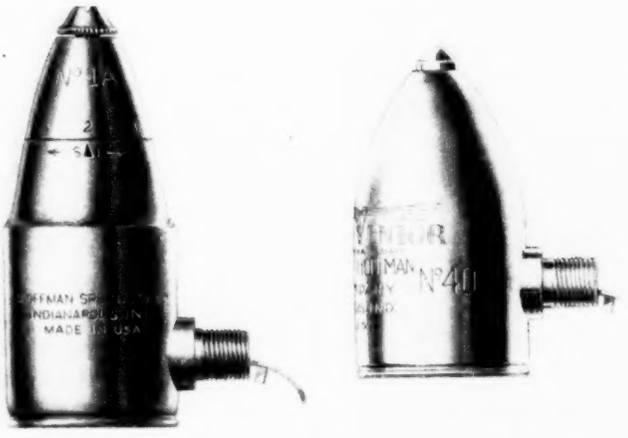


Fig. 9. Left, adjustable port radiator valve; right single port, non-adjustable air valve.

## Air-Vent Valves and Thermostatic Traps

Air-vent valves, used on radiators, Fig. 9 are diaphragm or bellows-actuated valves that allow air to escape to the atmosphere. When the cooler air is in contact with the bellows, the valve is open and the air is allowed to pass through. Steam coming in contact with the bellows vaporizes a volatile fluid within the bellows, expanding it and causing the valve to close. These valves are used on radiators in both one-pipe and two-pipe gravity systems and one-pipe vacuum systems.

Thermostatic traps, Fig. 10, are actually automatic valves used on steam radiators to hold the steam in the radiator until full condensation has taken place. The valve is held closed until the cooler condensate hits the bellows, which contracts and opens the valve, releasing the condensate and air. When steam reaches the bellows, the valve again closes.

Where large amounts of steam are handled, and condensate must be returned at steam temperatures, float-type traps, Fig. 10, are used in the return line. These traps also have a thermostatic valve in addition to the float valve, for releasing air from the system.

## Safety and Relief Valves

Any steam or water piping installation where pressures are involved requires safety or relief valves. There are a great many types, for a great many different pressures and conditions. Some are made of brass; some are made of iron; some are made of cast steel. All are spring controlled except a few for low pressure work which have lever-and-weight arrangements, Fig. 8.

The safety valve is one of the most important units on a steam boiler, for it automatically releases pressure to the atmosphere if an excessive pressure is reached within the boiler. Relief valves are recommended for pipe lines, pumps, cylinders, etc., to relieve excessive pressures.

Basically, pop-safety valves, Fig. 11, and relief valves are the same. All pop-safety valves are equipped with outside lifting levers, making it possible to test valve operation manually and to open the valve periodically to blow any accumulated foreign matter clear of the seating surfaces. Some types of relief valves are also made with manual-operating levers. The essential difference between pop-safety valves and relief valves is found in the action of the valves themselves.

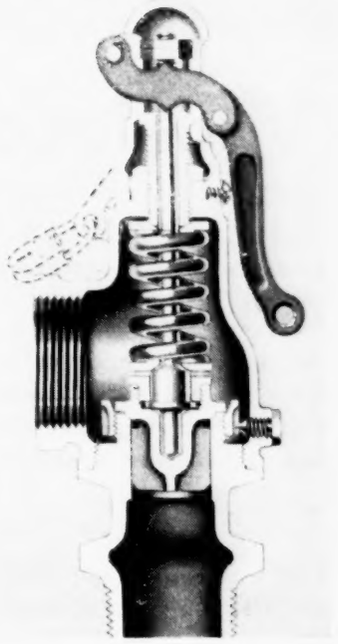


Fig. 11. A type of pop-safety or relief valve.

Pop-safety valves have a high relieving capacity, and as a rule the drop in pressure does not exceed 5% of the set pressure. Relief valves have a lower capacity, and the blow-down may be approximately 10% of the set pressure. Valves for small installations and low pressures are usually set during manufacture and sealed permanently so that the setting cannot be changed without damaging or destroying the valve. Other valves are adjustable in the field and may even be equipped with extra springs for greater flexibility in settings.

Safety or relief valves should always be installed with their stems vertical, to insure proper seating of the discs. Outlet piping, in types where the discharge is piped away, should be as short as possible, never smaller than the outlet of the valve, and should be arranged to give proper drainage.

Pop-safety valves and most modern relief valves have a quick-opening feature, in which quick opening is effected by means of the "huddling" chamber. In the huddling chamber the valve employs either a flat seating disc or a conical disc. As the disc unseats, steam at high velocity rushes into the chamber formed by an adjusting ring and an extension of the disc. The greater effective lift area results in more rapid opening. Rapid lift saves steam and promotes safety by allowing the valve to operate at very slight over pressures, and to close at similarly slight under pressures.

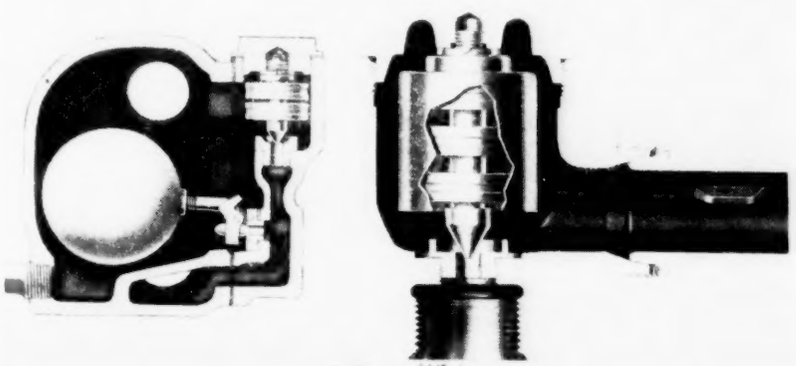


Fig. 10. Left, float type steam trap to handle large amounts of condensate; right, radiator thermostatic trap for medium and high pressure work.

## A Problem of Selection —

# Simple Ventilation vs Refrigeration

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**An examination of the engineering economics of air cooling systems employing simple ventilation as compared with those which use refrigeration for precooling the air supplied. Illustrative problems are included.**

ONE of the four following ventilation objectives governs the volume of air required for a simple ventilation system. That there may be no misunderstanding, a simple ventilation system is defined as the process of supplying untreated (except for filtering) outside air to an enclosed space. The objectives are:

1. Supply oxygen and remove carbon dioxide.
2. Reduce odor concentration.
3. Remove internal heat dissipated by occupants, machines, lights, etc.
4. Remove body moisture dissipated by occupants.

In almost all cases, if enough air is provided to reduce odor concentration, there will be more than a sufficient amount of oxygen supplied. If a thermally insulated room is occupied, each occupant dissipating 300 Btu per hr of sensible heat, the thermal equilibrium condition of the room is dependent only on the ventilation rate to the room. For a ventilation rate adequate to care for both oxygen and odor requirements, approximately 25 cfm per occupant, the temperature rise in the room is more than 11F over the outside air temperature. Such a temperature rise would be objectionable as far as comfort is concerned if the outside air were 70F or greater.

### Factor of Balance

Supplying outside air at a temperature greater than 79F would cause the equilibrium room temperature to rise over 90F which would cause severe discomfort or possible injury to health if the period of exposure were extended. To lower the equilibrium temperature of the room it would be necessary to either increase the simple ventilation rate or precool the air before it is supplied to the room. The purpose of this article is to compare the theoretical energy requirements of a simple ventilation system designed to prevent excessive room temperature rise, with a system using refrigeration to precool the outside air.

These two systems are schematically illustrated in Fig. 1. The analysis that follows is applicable only to a space in which all of the air is supplied by a fan. This anaylsis is especially suitable to marine ventilation systems and to industries where the criterion for determining the amount of air supplied is prevention of an excessive temperature rise. No attempt will be made to compare all of the relative merits of air conditioning and simple ventilation involving worker efficiency, cleanliness, health and capital cost.

Energy required for a simple ventilation system is only the power required to drive the fan. Energy required when refrigeration is used to precool the air supplied, is the energy for refrigeration plus a smaller power requirement for the fan. The quantity of air required to maintain a certain inside temperature can be found by establishing a heat balance on the room as follows:

Internal sensible heat load of room = (heat taken away by ventilation) + (heat loss by conduction)

For a room which has a comparatively small heat loss by conduction, this term in the heat balance can be dropped and the heat balance written as

$$SHL = \frac{60 \text{ cfm } C_p (t_i - t_s)}{v_s} \qquad (1)$$

where SHL = internal sensible heat load of room, Btu per hr

$C_p$ = specific heat of air, Btu per (lb) (F)

$t_i$ = inside design temperature, F

$t_s$ = temperature of air supplied to room, F

$v_s$ = specific volume of air, cu ft per lb

*Example 1:* (a) If a temperature of 70F is desired for a room having an internal sensible heat load of

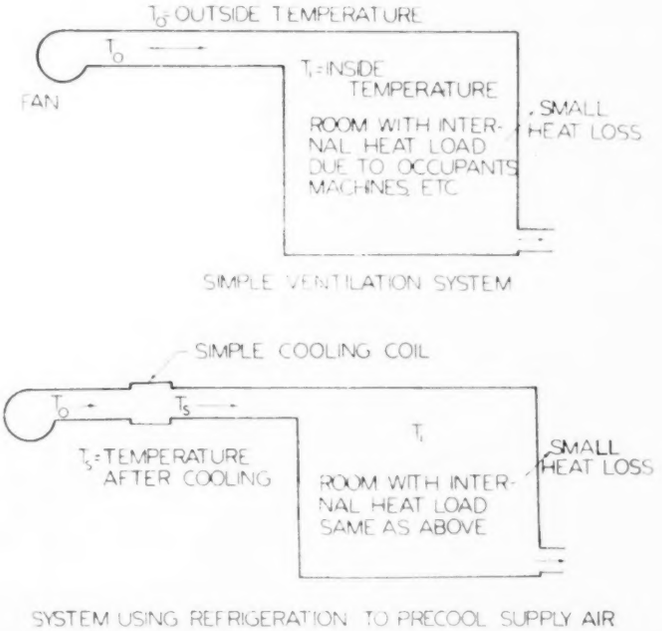


Fig. 1. Diagrams of the two systems described in article.

5000 Btu per hr when the outside temperature is 65F, find the ventilation rate of outside air required. (b) If the air supplied to the room were precooled to a temperature of 55F, what would be the volume of air required?

*Solution:* From Equation 1

$$\text{Cfm} = \frac{5000\ (13.5)}{0.24\ (70\text{-}65)\ (60)} = 937$$

Solving for condition (b)

$$\text{Cfm} = \frac{(5000)\ (13.5)}{(0.24)\ (70\text{-}55)\ (60)} = 313$$

It is obvious that more fan power will be required for the case of simple ventilation. The fan power required is given as*

$$\text{AHP} = \frac{(\text{TP})\ \text{Q}}{6350} \qquad (2)$$

where AHP = total air horsepower
TP = total pressure that fan operates, inches of water
Q = volume of air handled, cfm

The total power required for the simple ventilation system in Example 1 (a) when the fan is operating at a total pressure of 4.0 in. of water is

$$\text{AHP} = \frac{(4)\ (937)}{6350} = 0.590 \text{ hp}$$

### Ventilation Plus Refrigeration

The energy required to accomplish the same inside temperature using precooled air will be the fan power

$$\text{AHP} = \frac{(4)\ (313)}{6350} = 0.197 \text{ hp}$$

plus the energy required for simple cooling of the outside air from 65 to 55F. The energy necessary for refrigeration is

$$W_r = \frac{Q_a}{\text{C.O.P.}} = \frac{\text{cfm}\ C_p\ (t_o - t_s)}{42.42\ v_s\ \text{C.O.P.}} \qquad (3)$$

where $W_r$ = power for refrigeration, hp
$Q_a$ = heat absorbed by refrigerant from air, Btu per min.
C.O.P. = coefficient of performance of refrigeration unit
$t_o$ = temperature of outside air, F
$t_s$ = temperature to which air is cooled, F
$v_s$ = specific volume of air, cu ft per lb

The power required for refrigeration in Example 1 (b)

*Refrigeration and Air Conditioning, p. 252, Raber & Hutchinson, John Wiley & Sons, 1946.

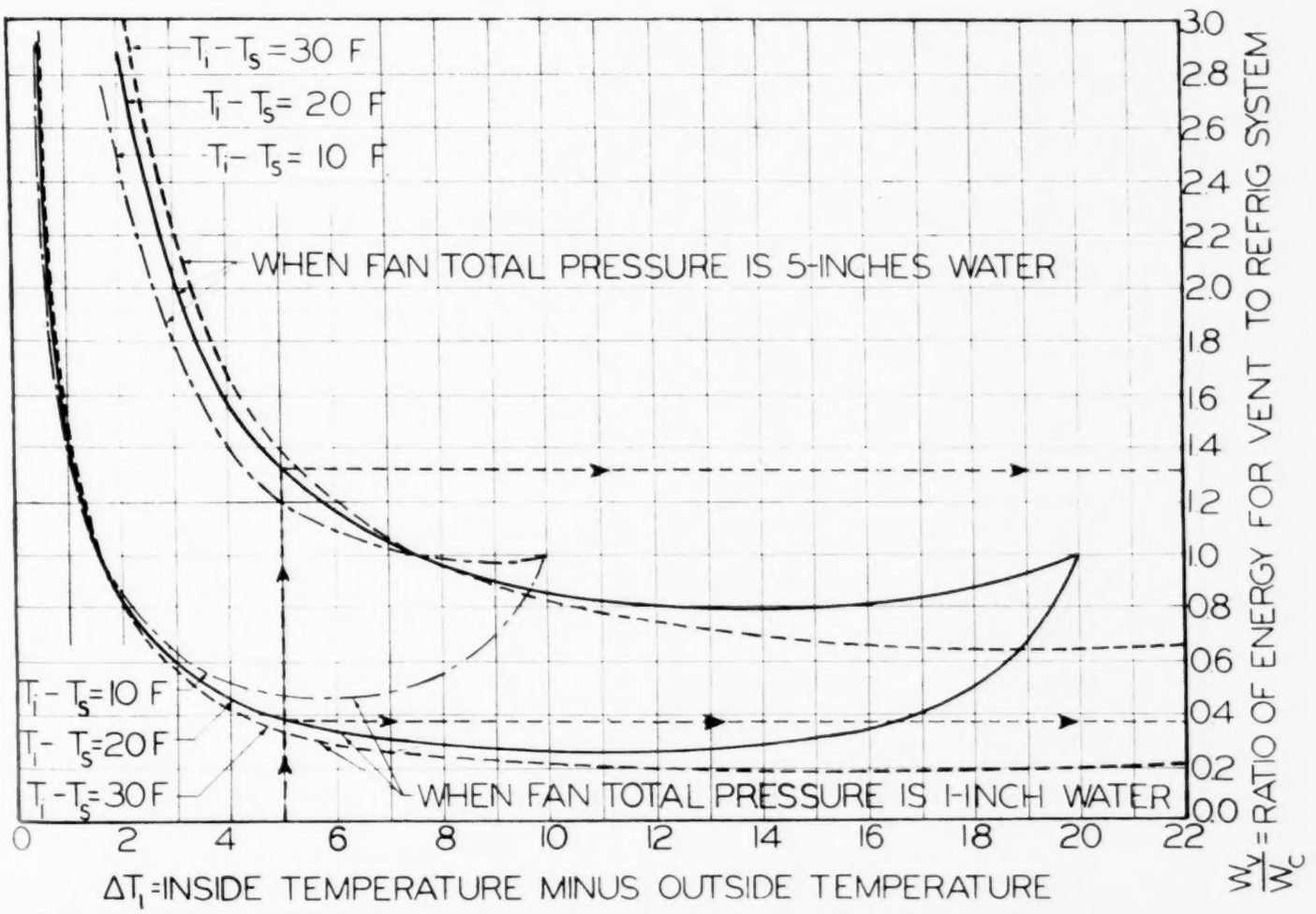
$T_i - T_s = 30$ F
$T_i - T_s = 20$ F
$T_i - T_s = 10$ F
WHEN FAN TOTAL PRESSURE IS 5-INCHES WATER
$T_i - T_s = 10$ F
$T_i - T_s = 20$ F
$T_i - T_s = 30$ F
WHEN FAN TOTAL PRESSURE IS 1-INCH WATER
0 2 4 6 8 10 12 14 16 18 20 22
$\Delta T_i$ = INSIDE TEMPERATURE MINUS OUTSIDE TEMPERATURE
3.0 2.8 2.6 2.4 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 0.6 0.4 0.2 0.0
$\frac{W_v}{W_c}$ = RATIO OF ENERGY FOR VENT TO REFRIG SYSTEM

Fig. 2. Graphical solution of equation No. 4 for various temperature conditions.

assuming a coefficient of performance of 4 is written

$$W_r = \frac{(313)\ (0.24)\ (65\text{-}55)}{(42.42)\ (13.5)\ (4)} = 0.328 \text{ hp}$$

The total power required when the supply air is precooled is (0.197 + 0.328) or 0.525 hp while the power required for the simple ventilation system is 0.590 hp.

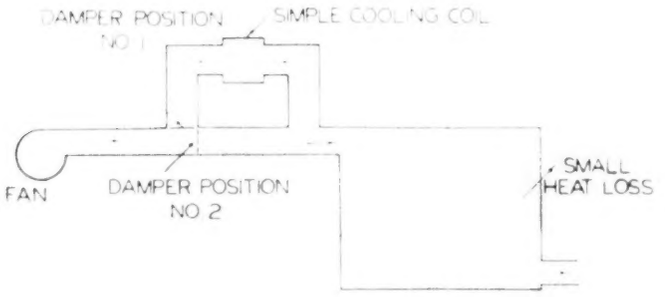


Fig. 3. Possible arrangement of a combination system.

If it had been assumed that the fan was operating at a total pressure of 2 in. of water instead of 4 in., the work required using refrigeration would be greater than that for simple ventilation. As the temperature difference between the air supplied and the room air decreases, the greater will be the fan power required to maintain a design temperature. Obviously the lowest possible inside temperature that can be maintained by a simple ventilation system is one just above the outside temperature.

By combining the Equations 1, 2, and 3, Equation 4 may be derived for the ratio of work required for a simple ventilation system to that for a system using refrigeration.

$$\frac{W_v}{W_c} = \frac{0.0278\ (TP)_v\ v\ \triangle t_2}{0.0278\ (TP)_c\ v\ \triangle t_1 + \dfrac{\triangle t_1 (\triangle t_2 - \triangle t_1)}{C.O.P.}} \qquad (4)$$

where $\frac{W_v}{W_c}$ = ratio of work required for simple ventilation to work required using precooled air

$(TP)_v$ = total pressure at which fan operates for the simple ventilation system, inches of water

$(PT)_c$ = total pressure at which fan operates for the refrigeration system, inches of water

$v$ = specific volume of outside air, cu ft per lb

$\triangle t_1 = (t_i - t_o)$ or temperature difference between the inside and outside air, F

$\triangle t_2 = (t_i - t_s)$ or temperature difference between the inside air and air supplied after precooling, F

C.O.P. = coefficient of performance of refrigeration unit.

A graphical solution of Equation 4 is shown in Fig. 2, based on the following assumption: C.O.P. constant at 4, specific volume constant at 13.5 cu ft per lb; total fan pressure of the simple ventilation system equal to the total fan pressure of the refrigeration system. An example will best serve to illustrate the use of this graph.

*Example 2:* A room is to be maintained at 80F when the outside air is 75F. Would a simple ventilation system or a system using refrigeration to precool air to 60F require less energy if the fans operate at a total pressure of 5 in. of water?

*Solution:* Enter Fig. 2 at $\triangle t_1 = 5$, rise vertically to $(t_i - t_s) = 20$ for a fan pressure of 5 in. of water, move horizontally to right and read $\frac{W_v}{W_c} = 1.33$. It therefore requires 33% more energy to operate the simple ventilation system than the refrigeration system.

*Example 3:* Consider the same conditions as given in Example 2 but with the fan operating at a pressure of only 1 in. of water.

*Solution:* Enter figure at $\triangle t_1 = 5$, rise vertically to $(t_i - t_s) = 20$ for 1 in. water fan pressure, move horizontally to the right and read $\frac{W_v}{W_c} = 0.38$. A simple ventilation system only required 38% as much energy as a refrigeration system.

Examination of Fig. 2 shows that simple ventilation systems requiring a total fan pressure of 5 in. of water will require less energy than a refrigeration system provided the difference between the inside and outside temperature is greater than 7.5F. A simple ventilation system requiring a total fan pressure of 1 in. of water will require less energy when the difference between inside and outside temperature is greater than 1.5F. In Fig. 2, the lines plotted for different values of $(t_i - t_s)$ for the same fan pressure intersect at a common point on the line $\frac{W_v}{W_c} = 1$. This simply indicates that the difference between inside and outside temperature alone determines which system requires less energy when the fan pressures are the same. The lines for different values of $(t_i - t_s)$ at low fan pressures tend to converge when the ratio of $\frac{W_v}{W_c}$ is greater than 1. This indicates that practically the same ratio of $\frac{W_v}{W_c}$ is obtained when the air is cooled to either 10 or 30F below the inside temperature.

It should be remembered that Equation 4 considers only simple cooling. If outside air has a high relative humidity, in order to cool it as much as 20F, it is very likely that the coil surface would have to be lower than the dew point temperature of the air. The latent heat of the water vapor would then have to be considered and Equation 4 would not apply.

In deciding between a simple ventilation system and a refrigeration system it should be remembered that it is impossible to obtain healthy conditions with simple ventilation if the outside temperature is much higher than 80F. Investigation of Fig. 2 might show that it would be economical to have a combination system. A possible arrangement is shown in Fig. 3. When the outside temperature rises beyond a certain value, the damper could be changed to position number 2, thereby putting the refrigeration system in operation.

# Progress Report on Heat Transfer Tests of a Buried Copper Pipe

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**A series of heat transfer tests using the earth as a heat absorber from a buried copper pipe are described and interpreted as a step toward providing design data for sizing horizontal buried coil.**

TWO pressing problems facing development of the heat pump are: determination of the relative economies of various heat sources, and development of design procedure to give assurance of adequate performance. Southeastern Electric Exchange has encouraged a study of design and economic factors of heat sources for the heat pump. One result has been this study of copper pipe buried horizontally in the ground. Test results are offered as a preliminary guide to design of a heat source by giving some indication of the length of pipe needed, spacing, depth, heat transfer coefficients, size of pipe, etc.

Fig. 1 is a schematic layout of the installation of

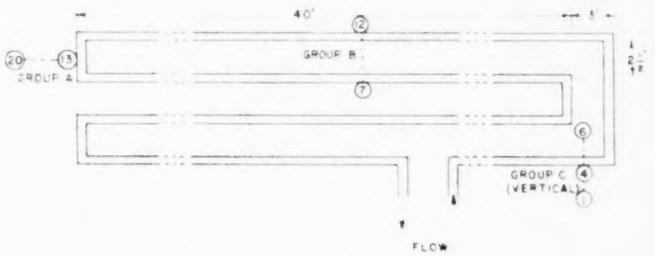


Fig. 1. Schematic piping layout, not to scale.

180 ft of $1\frac{1}{4}$-in. copper pipe buried in moist red clay soil 2 ft below the surface of the ground. This system was coupled through well insulated pipes to a gas water heater. Hot water was then circulated until various conditions of equilibrium were established.

The earth was used as a heat sink. That is, heat was pumped into the earth all through the test. This practice probably affected heat transfer rates more adversely than utilization of earth as a heat source, because heat pumped into the ground tends to reduce the moisture content and thereby reduces the heat transfer coefficient.

The first part of the test was undertaken to determine temperature gradients around the pipe and the amount of heat the earth would absorb. In order to measure earth temperatures, 20 thermocouples were placed in three groups about the pipe as shown in Fig. 1. Group *A* represents a horizontal distribution out from the pipe. Group *B* extends between two pipes. Group *C* is arranged vertically.

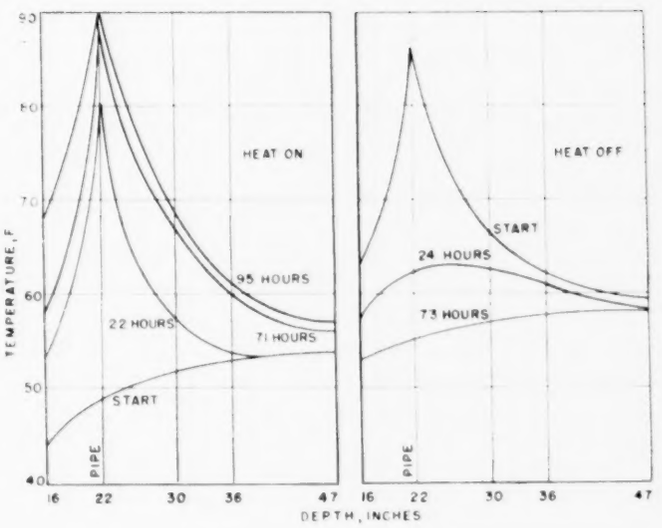


Fig. 2. Temperature gradient of vertical run.

The tests were conducted by circulating heated water continuously through the piping for a period of eight days. While no attempt was made to control water supply temperature, periodical readings of temperature and flow volume were recorded for both supply and return water. Temperature readings at all thermocouples were also recorded at about the same intervals. Peak supply water temperature was 96F and occurred during the 95th hour of test run. At the end of eight days, circulation of water was stopped

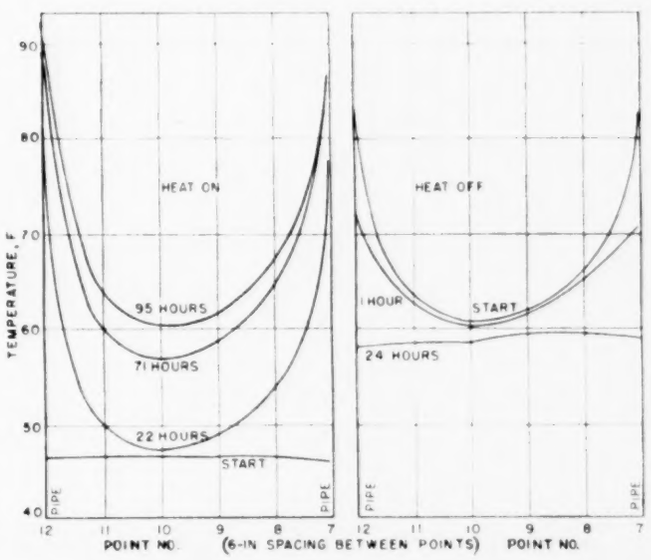


Fig. 3. Temperature gradient between pipes.

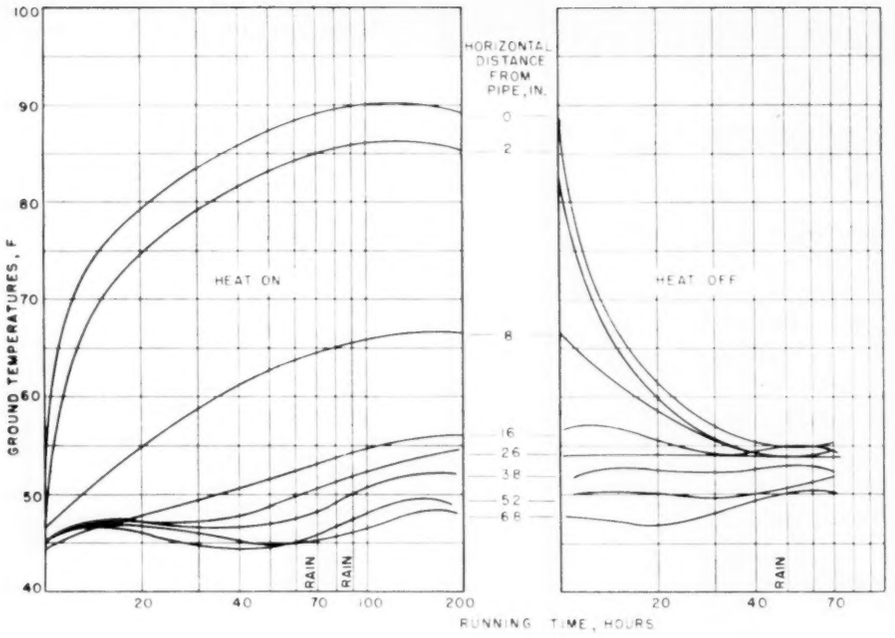


Fig. 4. Temperature vs. time, horizontal run.

and another set of readings taken as the ground returned towards normal temperature. Fig. 2, 3, and 4 show these two sets of readings.

## Second Run

At the conclusion of this part of the test it was decided that the discharge water temperature must be controlled in order to obtain more accurate data. This was done by employing a solenoid shut-off valve on the gas heater, a thermostat located in the discharge water line, and a water by-pass to give a more sensitive temperature control which would maintain the water within 1F at all times. The thermocouples were rearranged to give both vertical and horizontal temperature distribution from a single point on the system, point 13 in Fig. 1. Test readings were made at supply water temperatures of 80, 90, 100, and 110F allowing time in each instance for the earth temperature to become more or less stabilized before increasing the discharge temperature. Water flow was kept constant throughout the test. All temperatures were periodically recorded and are shown in Table 1.

## Discussion of Results

During the first part of the tests the gas water heater maintained a fairly constant output (approximately 9000 Btu per hr) which the ground absorbed. This represents approximately 50 Btu per (hr)(ft) of pipe length or 16.3 Btu per (hr)(sq ft) of pipe surface. Assuming a differential of 40 degrees between pipe and ground, we have 1.25 Btu per (hr)(ft)(F) or .41 Btu per (hr) (sq ft) (F).

It can be seen that the vertical and horizontal temperature curves tended to conform with each other very closely after about 95 hours running time. Prior to this the remote vertical points tended to increase more rapidly than the horizontal possibly due to the

**Table 1 — Data of Second Test Run on Buried Copper Pipe**

| April and May, 1947 | | Temperatures F | | Distances of Thermocouples from Pipe, Inches | | | | | | | | | | | | | | | | | | | Water Characteristics | | | | Running Time, Days | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Horizontal Run | | | | | | | Vertical Run | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | Down from Pipe | | | | | | | Up from Pipe | | | | | | Temp., F | | Vol. | Heat, | Cumulative | Each temp. |
| | | | | 1 | 3 | 5 | 7 | 11 | 19 | 29 | 29 | 19 | 11 | 7 | 5 | 3 | 1 | 1 | 3 | 5 | 7 | 11 | 19 | Sup. | Ret. | GPM | Btu/hr | | |
| Date | Time | Pipe | Air | Temperatures, F. at Various Distances | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | 0830 | 59 | 66 | 53 | 59 | 59 | 58 | 59 | 58 | 59 | 59 | 59 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 59 | 58 | 57 | 59 | | | | | | |
| | 1000 | | | Heat on and water circulating | | | | | | | | | | | | | | | | | | | | 71 | 68 | 2.5 | | | |
| | 1600 | 75 | 75 | 57 | 61 | 60 | 58 | 59 | 60 | 60 | 60 | 60 | 60 | 62 | 65 | 64 | 67 | 69 | 64 | 63 | 63 | 63 | 71 | 80 | 75 | 2.5 | 6257 | ½ | ½ |
| 23 | 1000 | 75 | 77 | 65 | 65 | 64 | 57 | 63 | 61 | 61 | 60 | 60 | 63 | 65 | 69 | 69 | 71 | 72 | 68 | 65 | 64 | 63 | 72 | 80 | 76 | 2.5 | 5007 | 1 | 1 |
| 24 | 1000 | 75 | 80 | 68 | 67 | 66 | 64 | 64 | 63 | 63 | 60 | 61 | 64 | 66 | 69 | 70 | 72 | 73 | 70 | 69 | 67 | 67 | 76 | 80 | 76 | 2.5 | 5007 | 2 | 2 |
| 25 | 1000 | 76 | 84 | 70 | 69 | 66 | 65 | 65 | 64 | 63 | 60 | 62 | 65 | 67 | 71 | 71 | 72 | 73 | 71 | 70 | 69 | 69 | 79 | 80 | 76 | 2.5 | 5007 | 3 | 3 |
| 28 | 1000 | 76 | 75 | 70 | 69 | 66 | 65 | 65 | 64 | 63 | 62 | 63 | 66 | 68 | 71 | 71 | 72 | 73 | 71 | 69 | 67 | 66 | 71 | 80 | 76 | 2.5 | 5007 | 6 | 6 |
| 29 | 1300 | 78 | 82 | 73 | 71 | 69 | 66 | 66 | 64 | 63 | 62 | 64 | 67 | 71 | 75 | 75 | 78 | 79 | 74 | 71 | 69 | 69 | 78 | 90 | 84 | 2.5 | 7509 | 7 | 1 |
| 30 | 1300 | 85 | 65 | 74 | 71 | 70 | 68 | 66 | 65 | 63 | 63 | 64 | 68 | 71 | 75 | 75 | 79 | 80 | 75 | 72 | 71 | 70 | 69 | 90 | 85 | 2.5 | 6258 | 8 | 2 |
| 5 | 1300 | 82 | 91 | 75 | 74 | 72 | 69 | 69 | 67 | 66 | 64 | 66 | 70 | 73 | 77 | 75 | 74 | 77 | 72 | 72 | 77 | 74 | 90 | 90 | 85 | 2.5 | 6258 | 13 | 7 |
| 6 | 1430 | 90 | 84 | 80 | 77 | 74 | 72 | 71 | 69 | 66 | 64 | 67 | 72 | 77 | 81 | 82 | 86 | 87 | 82 | 80 | 79 | 78 | 89 | 100 | 93 | 2.5 | 8760 | 14 | 1 |
| 8 | 1300 | 99 | 84 | 80 | 78 | 75 | 72 | 71 | 69 | 66 | 66 | 69 | 74 | 78 | 82 | 83 | 85 | 87 | 81 | 79 | 79 | 79 | 94 | 100 | 93 | 2.5 | 8760 | 16 | 3 |
| 9 | 1300 | 95 | 84 | 81 | 78 | 76 | 73 | 72 | 69 | 67 | 66 | 69 | 74 | 78 | 83 | 83 | 86 | 87 | 82 | 79 | 78 | 78 | 95 | 100 | 94 | 2.5 | 7509 | 17 | 4 |
| 12 | 1300 | 95 | 88 | 82 | 80 | 77 | 75 | 73 | 70 | 68 | 68 | 70 | 75 | 80 | 84 | 84 | 87 | 88 | 84 | 81 | 80 | 80 | 97 | 100 | 94 | 2.5 | 7509 | 20 | 7 |
| 13 | 1230 | 103 | 92 | 87 | 82 | 80 | 77 | 74 | 71 | 70 | 68 | 71 | 77 | 81 | 87 | 89 | 91 | 94 | 88 | 85 | 83 | 83 | 99 | 110 | 102 | 2.5 | 10012 | 21 | 1 |
| 15 | 1330 | 102 | 98 | 87 | 84 | 81 | 77 | 75 | 72 | 70 | 69 | 72 | 78 | 84 | 88 | 89 | 93 | 94 | 88 | 89 | 82 | 82 | 95 | 110 | 103 | 2.5 | 8760 | 23 | 3 |
| 16 | 1400 | 104 | 97 | 88 | 84 | 81 | 79 | 77 | 74 | 71 | 71 | 73 | 79 | 85 | 90 | 90 | 94 | 95 | 91 | 87 | 85 | 85 | 97 | 110 | 104 | 2.5 | 7509 | 24 | 4 |
| 22 | 1400 | 104 | 89 | 88 | 84 | 81 | 78 | 77 | 73 | 71 | 72 | 75 | 81 | 85 | 89 | 89 | 93 | 94 | 87 | 83 | 80 | 80 | 87 | 110 | 102 | 2.5 | 10012 | 30 | 10 |

proximity of a nearby building. The temperature effect was pronounced at about 2 ft from the pipe and still noticeable at 3 ft.

It is interesting to note that sluggishness of the ground in returning to normal even after a 24-hr period. Although the temperature gradient had leveled off, the mean temperature was well above that at the start.

It is also interesting to note the effect of moisture in the form of rain on the ground temperatures. Although not immediately felt, it had the effect of increasing conductivity as it soaks downward. The vertical temperatures were affected quite soon after a rain, but the horizontal ones did not change appreciably for about three days. If the pipes had been deeper the delay after a rain would have been greater and its effect probably less noticeable. Exact analysis of vertical temperatures above the pipe is difficult because the ground surface temperature is too influential at the shallow depth used.

The second series of tests was made while maintaining a constant water discharge temperature permitting earth temperatures to become stabilized. These tests were repeated for different water temperatures as shown in Table 1. The ground temperatures were plotted showing the temperature gradient both vertically and horizontally from one point on the pipe system, Fig. 5 and 6.

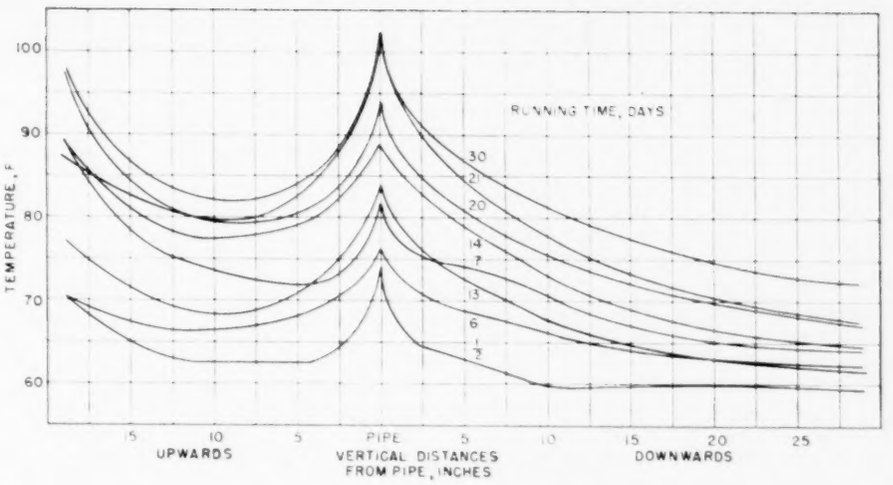


Fig. 6. Vertical temperature gradients above and below piping.

## Heat Flow

To eliminate variables involved in mathematical solution of heat flow problems for unsteady state conditions, ground temperatures were allowed to become more or less stabilized so that the heat transfer formulas for steady state conduction could be applied. For such a condition the heat which is transferred will be

$$q = 2\pi\, kL \frac{(t_1 - t_2)}{\ln (r_2/r_1)}$$

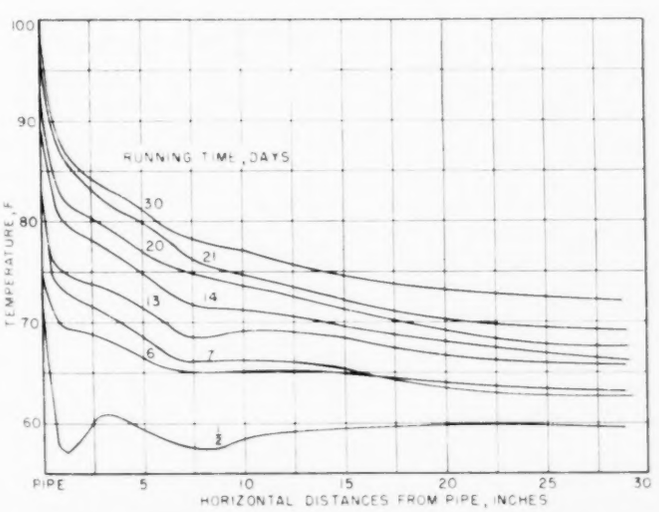


Fig. 5. Temperature vs. distance, horizontal run.

where $q$ = Btu per hr

$k$ = thermal conductivity of earth in Btu per (hr) (sq ft) (F)

$L$ = length of pipe in feet

$t_1$ = temperature at inside radius of a heated cylinder of earth (pipe surface)

$t_2$ = temperature at outside radius of earth cylinder

$r_1$ = inside radius of earth cylinder (O.R. of pipe)

$r_2$ = outside radius of earth cylinder

This formula assumes the heat source to be a cylinder of earth concentric with the pipe. It also assumes that there is no resistance to heat flow through the pipe itself and that the earth maintains good contact with pipe with no air spaces or loosely packed earth. (Otherwise, the solution will follow more nearly the theory for heat flow through multiple resistances.)

To eliminate excessive calculation the heat transfer formula has been set up in graph form as shown in Fig. 7. By using this graph any unknown may be found quickly. The performance of the system above may be estimated using the following values:

$$t_1 - t_2 = 90 - 50 = 40F$$
$$L = 180 \text{ ft}$$
$$r_2/r_1 = 50$$
$$k = 0.8$$

$r_2/r_1$ was assumed on the basis of about 30 inches being the maximum distance the temperature effect might be felt. The value of $k$ was estimated from values found in the literature and has been extended as shown in Table 2.

To solve for $q$ follow the line $r_2\ r_1 = 50$ upwards to the intersection with $k = .8$ curve. Proceed right from this intersection to $L = 180$ line, then downward to find heat flow, which is 230 Btu per (hr) (F) = 9200 Btu per hr. The final accuracy depends greatly on the accuracy of $r_2/r_1$ and $k$.

This chart may also be used in studying various effects on the heat conductivity $k$. As a first step, the

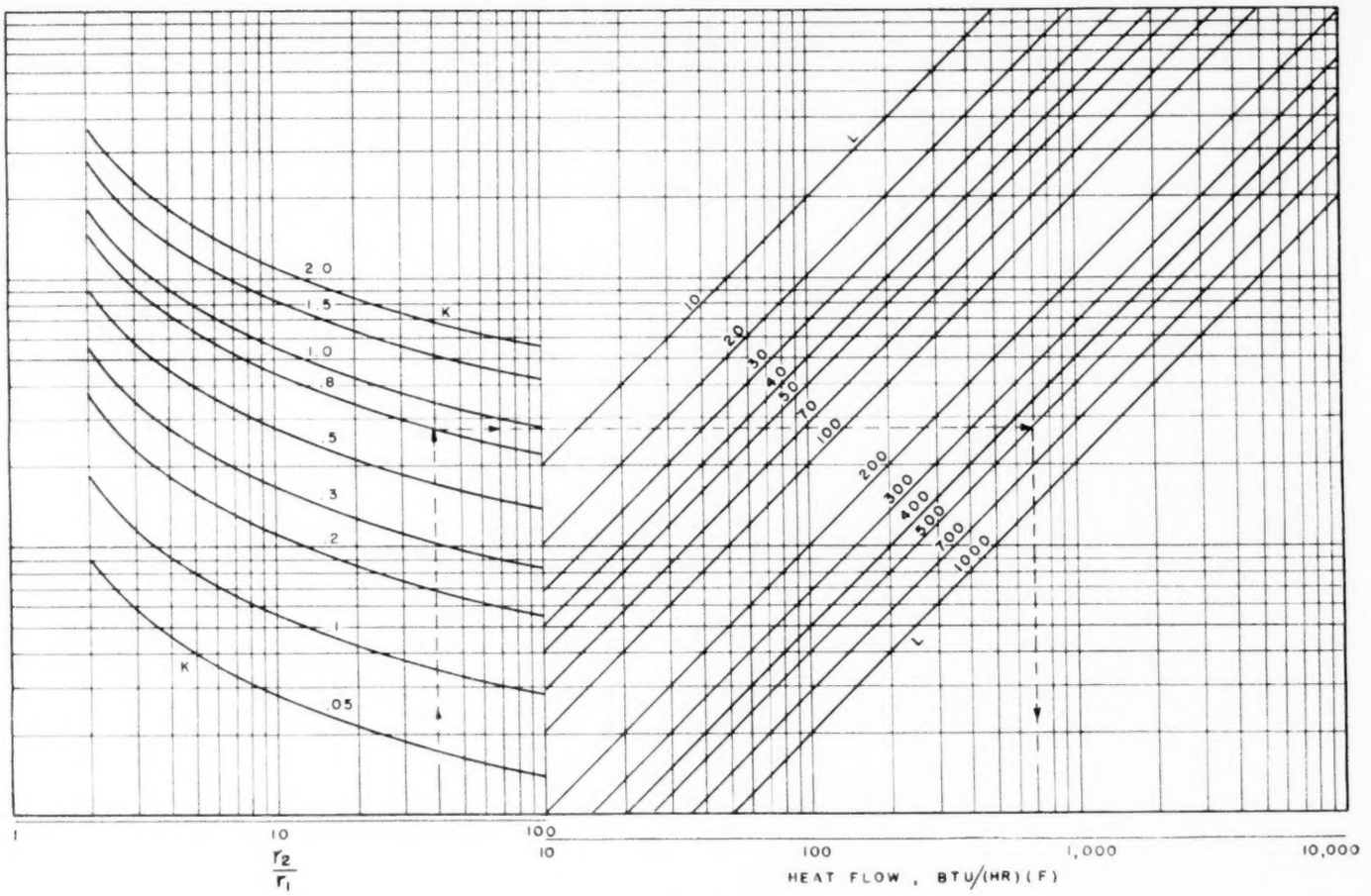


Fig. 7. Heat flow chart.

results from the tests were taken and the values of $k$ to give these results were determined. This assumes that $k$ is the determining factor. The values of $k$ were found for different radii $r_2$ assuming homogeneous conditions. The $k$ value, then, represents the average effective $k$ for a cylinder of earth with a radius $r_2$. In Table 2 it will be noticed that $k$ increases with $r_2$. This may be due to a drying out of the soil in the vicinity of the pipe. Values of $k$ for $r_2$ greater than 12 to 18 in. are fairly constant and probably represent the major area affected by heat with respect to drying. With a temperature increase, the effect is noticeable at a much greater distance, 24 to 30 in., from the pipes. It is recognized that the use of the above equation for the system used is far from theoretically correct but it is believed valid enough to draw some conclusions.

**Table 2 — Effective Thermal Conductivities (k values) of Earth**

| Distance from pipe, inches | Day of Test | | | |
|---|---|---|---|---|
| | 6th | 13th | 20th | 30th |
| | k value | | | |
| 1 | .2 | .5 | .31 | .33 |
| 3 | .88 | 1.0 | .7 | .7 |
| 5 | .9 | 1.0 | .75 | .75 |
| 7 | .95 | .95 | .75 | .75 |
| 11 | 1.1 | 1.2 | .85 | .9 |
| 19 | 1.25 | 1.25 | .85 | .9 |
| 29 | 1.25 | 1.2 | .8 | 1.0 |

## Conclusions

According to the reported tests it is likely that nearly 800 ft of 1¼-in. pipe would be required for a 3-ton unit for the given test conditions. The vertical system with the underground water immediately surrounding it has good transfer, whereas the horizontal system depends primarily upon contacts with the ground and its natural moisture content for heat transfer.

It should be pointed out that these tests were made in damp red clay where $k$ is quite high. More moisture in the ground would decrease the amount of pipe needed. This would probably require some special soaking device. Generally, $k$ will equal more nearly .3 to .7 so that proportionately more pipe would be needed in the average installation. These tests also show that the temperature effect is felt at least 2 ft from the pipe which means that the horizontal pipes should be spaced 4 ft or more apart. Some type of trench digger would probably offer the most economical method of laying pipes horizontally. Two levels would be possible.

It should be emphasized that the results reported here are for pipes in only one type soil. Other tests and experiences indicate that soil conditions have a tremendous influence on performance.

# Air Conditioning Multi-story Buildings by Central Station Systems

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**The first of a series of articles by a group of engineers to describe the features of some systems used for air conditioning multi-story buildings. Each article will discuss the design details and operating features of the system described so that a better understanding of this air conditioning application will result.**

DESIGN arrangement, initial cost, operating economies, and building alterations are the primary objectives for modernization and renovation of office buildings.

The design engineer must consider the load factors, number of persons, lighting, transmission heat losses or gains and sun effect, all calculated by zone exposures. Capacity requirements determined, the selection of the type of air conditioning system is the next consideration. The system, to be complete, must heat and humidify in the winter, cool and dehumidify in summer, provide clean air and ample ventilation the year round, and most important, the conditioned air must be circulated quickly and without drafts to the occupied spaces. The central station type of system performs all of these functions adequately and completely. Furthermore, washed clean air from a spray type humidifier or dehumidifier provides a beneficial freshness which has an exhilarating effect upon the occupants.

The central station system of air conditioning is a field assembly of factory made, functional equipment. To apply this equipment, the physical conditions of the building must be thoroughly studied before the design of the system and proper selection of equipment can be made. Since each office building is different, many variations, ramifications and arrangements of this equipment are possible without change in the functions performed and economical operation. One typical arrangement for a central station system design, readily adaptable to office buildings, with a minimum of structional alterations is shown in Fig. 1. This system design is known as a central station type, with booster fans, each arranged with isolated by-pass recirculation. By-passing recirculated air on each floor saves considerable sheet metal duct work and provides uniformity of temperature and humidity control.

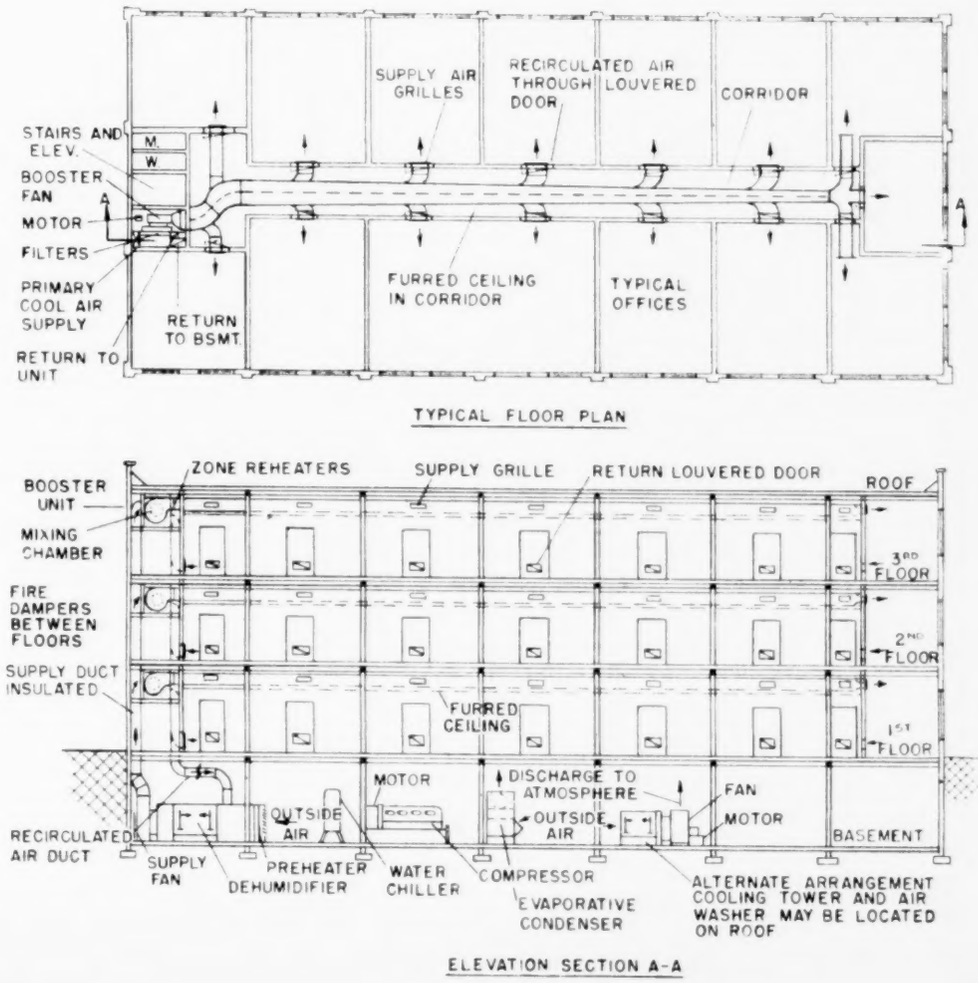


**Fig. 1. Diagram of typical arrangement for a central system design, readily adaptable to office buildings, with minimum of structural alterations.**

Special consideration may be provided for individual situations that are subject to fluctuating heat loads.

### Central Station System

The central station system schematically shown in the basement, consists of the main supply fan, spray type air washer, humidifier or dehumidifier preheaters and dampers, all assembled with field fabricated sheet metal casings. Air is drawn in from outside through louvers, screen and preheaters, mixed with recirculated air at the inlet to the dehumidifier, and properly conditioned when leaving the dehumidifier. The main supply fan discharges the primary dehumidified air at approximately 50F through insulated cold air ducts to the booster fan units located on each floor, furnishing ample, fresh cool air to the conditioned spaces. In some applications, particularly large buildings, the primary conditioned air apparatus may be located on an intermediate floor supplying cool air to booster units, on floors above and below.

The design of the system in Fig. 1 will affect a considerable saving in the refrigeration tonnage requirements, by recirculating air to the inlet side of the dehumidifier, and result in lower first cost and a continual saving in the cost of operation by using less power. The primary air fan operates at low outlet velocity, and low static pressure. This further saving in horsepower results in year-round economy of operation.

### Typical Booster Fan Room Layout

The cool conditioned supply air is mixed with recirculated air in the mixing chamber and is drawn through filters. The fan discharges the air through zone heaters of the fin type, through the distributing duct system. With this arrangement the booster fan operates on low static pressure, with a saving in horsepower, low outlet velocities, and quiet operation.

### Distribution of Air

A vital feature of an air conditioning system is the proper design of the air distribution. No matter how efficient the equipment may function, if the air is not distributed properly the results are not satisfactory. The conditioned air must be supplied to all points, with positive circulation. In no case is an air conditioning system better than its air distribution.

As the problems of good distribution are different for every office building, a thorough study of special local conditions by the design engineer, combined with practical experience are required to assure good results. The supply ducts in this typical illustration are installed overhead in the corridor with supply outlets at the ceiling of each room. Return air is circulated through louvered doors or undercut doors in each room into corridors and returned to the booster fan.

The supply outlets are placed so, that if at any future time interior partitions are relocated, enlarging or reducing rooms, the distributing system will not be effected. In case a cross partition is installed only a short duct extension is necessary.

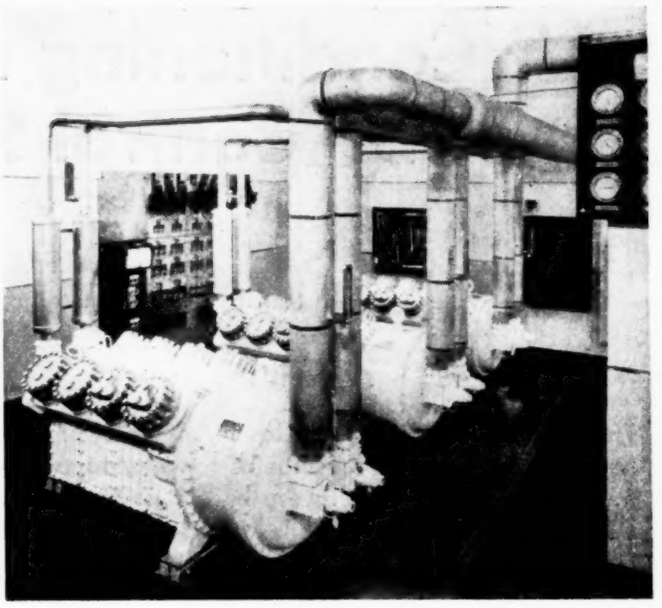

Fig. 2. A typical refrigeration installation.

Special designed supply grilles are installed for diffusing the air in each room with adjustable angular vanes so that a stream of cool air, delivered at the ceiling, discharges toward the outside wall surfaces, to assure comfortable conditions, free from noise and drafts.

### Refrigeration System

The refrigeration plant consists of one or more motor-driven compressors, condenser, water chilling unit, piping and all auxiliary equipment to make a complete system. The refrigeration plant provides chilled water that is circulated by a pump and then sprayed in a fine mist in the dehumidifier. The contact of the warm air with the chilled water effects an exchange of heat, cooling and dehumidifying the air to a predetermined saturated condition leaving the dehumidifier. The pump returns the warm water, from a weir type overflow in the dehumidifier tank to the chilling unit and completes the continuous cycle. The refrigeration compressor or compressors may be provided with unloaders, to follow automatically a reduction in cooling load and economize on power consumed. A typical refrigeration installation is illustrated in Fig. 2.

### Condenser Water Cooling System

The refrigeration plant requires water for condensing the hot discharge gas from the compressor. In some geographical locations water is plentiful and cheap and may be used directly for condensing from the city water mains. Recent experience shows that many city codes require conservation of water. To economize on water, some means for cooling the condensing water, and then recirculating back through the condenser is required.

There are several methods to meet this requirement. The method shown in Fig. 1, an evaporative condenser (eliminating water cooled condenser) is a forced draft type, spraying a fine mist of water on hot refrigerant

gas condenser coils, effecting cooling by evaporation of water, resulting in a saving of water consumption and economy in power. This type of equipment is frequently applicable where space is at a premium within the building or may be located on the roof.

The alternate arrangement shown used with water cooled condenser is a forced draft unit air washer type. A fan draws outside air through the cooling tower air washer, discharging the hot air to atmosphere. The hot condensing water is sprayed in a fine mist, thus an exchange of heat from hot condensing water to air, cools the water. The hot air is discharged to atmosphere. In some cases a natural draft or forced draft cooling tower may be used to advantage.

### Automatic Temperature and Humidity Control

A typical system should be designed for summer inside dry bulb temperature of 78 to 80F with an average of 50% relative humidity. Outside design conditions will vary with the geographical location. The inside dry bulb temperature in the summer is controlled by a thermostat in the return air, controlling mixing dampers in the cool primary air return air connections. Zone control may be provided when desired. In winter, thermostats in the booster fan discharge zone ducts operate the zone booster heaters and deliver air to the conditioned areas at a temperature slightly below room temperature. The direct radiation, already installed, makes up the marginal heat requirements.

Particular consideration should be given to coordinate control of the summer and winter operation so that the air conditioning system and the installed radiation will function in proper sequence.

Relative humidity is maintained by controlling the dew point temperature of the air leaving the dehumidifier. A thermostat immersed in the dehumidifier tank operates the outside air and recirculated dampers, and in summer regulates the quantity of chilled water to meet varying load capacity. In the winter, the tank thermostat actuates the preheater to maintain a constant dew point temperature in the air leaving the humidifier. When practical, the automatic control system should be designed to take advantage of between season operations, using all outside air with low wet bulb, and accomplish an additional saving in the cost of operation.

### Operating Costs

The space occupied by a typical central station system generally will not require any leased rentable space; in extreme applications a maximum of approximately 3% of rentable space will be required. The booster unit equipment can often be located on the ceiling in non-leased service areas.

The total investment to the purchaser, based on 4% interest rate and yearly operating costs (power, water, steam and maintenance labor) will vary from 15 to 35c per sq ft of rentable floor space per year. On this basis rentals may be adjusted by increasing the rent per square foot to operate at a substantial profit or more frequently by increasing the percentage of rented space, without increasing the rent per unit.

Air conditioning costs for office buildings may be compared another way. Divide the yearly cost of the total investment by the total number of employee-hours per year. By this yardstick comparison, the air conditioning will cost 2 to 3 cents per person per hour.

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## Exploring Fire

Engineers are taking a close look at one of the oldest phenomena known to man—the flame. At Westinghouse in East Pittsburgh a large, modern, research laboratory, is studying those aspects of combustion, which are of vital importance to gas-turbine and jet-engine designers.

Part of the research has to do with flame propagation rates at low or high pressures. Curiously enough, flame travels relatively slowly through gases—say two to five feet per second—unless other factors are brought to bear. It is these other factors that are important. Ways of providing large flame areas, reverse flow, and turbulence; effect of pressures, mixture, temperatures, and nature of fuel, all are undergoing critical study particularly at pressures other than atmospheric.

Air flow in chambers burning light fuels is another subject of study. For example, what is the best configuration of air inlet holes? It has already been found that large holes with relatively low air velocity provide a better combination of flow path and turbulence than small holes and high velocity. The factors affecting flame stability are also being analyzed.

One practical development has been a combustion chamber in which heavy fuel, such as bunker C, can be burned. Here the problem was to develop a burner, small, efficient, with long life, free from carbon deposits and hot spots, in which the fuel could be ignited readily and reliably with a flame stable under a wide variety of loads.

The combustion chamber developed is now being used on the locomotive type gas turbine. It is a stepped, nickel-chrome steel tube 36 in. long and varying in diameter from 3 to 4½ in. Heat release is about 3,000,000 Btu per (cu ft) (hr) (atmosphere). Although flame temperatures run around 3500F, the combustion-chamber sleeve remains at about 1000F. This is accomplished by introducing cooling air between the stepped sections to maintain a protective blanket along the wall of the chamber.

Among other important phases of present research is development of devices and techniques for accurately measuring temperature in combustion chambers. Another major field of research on which much has been accomplished is combustion of pulverized coals.

# Methods of Joining Cast Iron Pipe

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**The second of a three-part article covering the types of joints used for connecting cast iron pipe. This material on cast iron pipe is part of the group of articles dealing with general methods of joining pipe.**

THE ordinary bell and spigot type joint is usually not sufficiently flexible for submarine lines because the joint is too rigid to permit the pipe to adapt itself to conditions on river bottoms where settlements commonly occur after the pipe has been laid. James Watt, the inventor of the steam engine, was also the inventor of the first flexible pipe joint which was laid across the river Clyde in 1810.

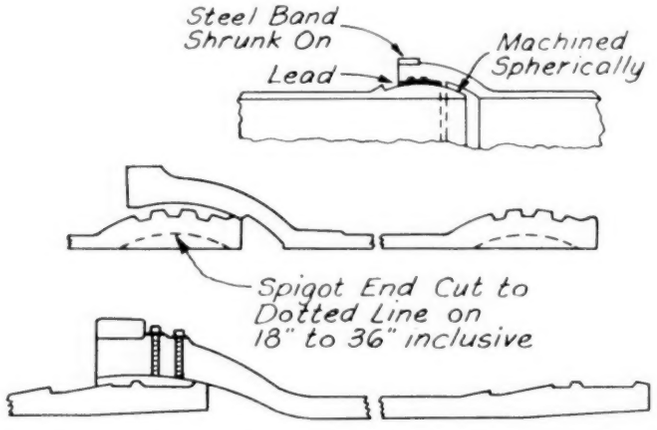



Fig. 1 (upper) Metropolitan type joint. Fig. 2 (center) Ward type, and older form of flexible joint. Fig. 3 (lower) Narrows siphon joint.

The Metropolitan type joint, Fig. 1, is the most commonly used joint of this type because of its simplicity. The spigot end of this pipe is carefully machined to a spherical surface and the integrally cast-on ring on the inside of the bell is machined to a radius corresponding to the spigot diameter. This ring serves a triple purpose; it centers the spigot of one pipe with the bell of the other; it provides a stop for the lead; it limits to an exact dimension the distance the spigot extends into the bell, thus providing a solid bearing in the deflection. As with this type of joint the lead is stationary and it can be readily and effectively calked.

The shoulder at the back of the spherical finished surface of the spigot is formed when finishing the spigot and prevents any possibility of deflection to a point where the spigot piece would not have a tight bearing on the ring seat in the bell. A deflection of about 13° can be successfully used with this type of joint.

In the larger sizes of this type of pipe, it is customary to shrink a steel band on the outside of the bell to prevent injury to the pipe during transportation and handling in the field.

Fig. 2, the Ward type joint, is an older form of flexible joint. Grooves are cast in the ball shaped spigot piece and a raised lip on the end of the spigot is machined spherically to match a similar finish on the inside of the bell. The lead is anchored to the spigot piece by the grooves and moves with it. This sometimes results in the lead being shaved off by the edge of the bell as the pipe is bent and for this reason, it is not generally used.

The Narrows siphon type joint, so named because it was the first line installed across the entrance to New York Harbor between Brooklyn and Staten Island, is shown in Fig. 3. The inside of the bell is carefully machined and ground to gauge on a radius. The lower end of the spigot is finished to correspond with the diameter of the spherical inside of the bell.

With this type of joint, the lead moves with the spigot when the pipe deflects, which makes it impossible to calk the lead. To compensate for shrinkage of the lead in cooling, small lead pellets are forced into the lead space by means of gib screws. This joint has proven very satisfactory and careful tests have shown it to be nearly 100% tight.

A cross section of a Doublex simplex joint is shown in Fig. 4. This joint is used extensively for water, gas, sewage, gasoline and oil lines at pressure up to 1,000 lb per sq in. With this design, the joint is not within itself restrained against endwise separation. In normal buried service the grip of the earth is sufficient to prevent any endwise movement of the pipe. This joint is not recommended for exposed pipe lines, river crossings or other submarine installations.

It consists of a specially formed bell shaped to receive a wedge shaped composition rubber gasket which is held in place and compressed to provide a tight joint between the two pipes by means of a cast iron gland. The gland is taken up by means of alloy cast iron bolts and nuts. The end of the spigot piece is plain. Gaskets with independent lead rings, lead

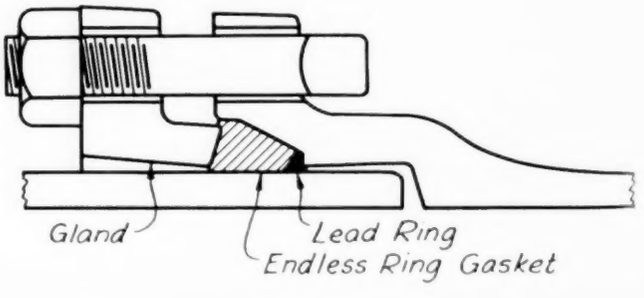



Fig. 4. Details of the Doublex simplex joint.

tips, duck tips or Thiokol tips can be obtained to meet special requirements.

The Doublex simplex lock joint, Fig. 5, is a modification of Fig. 4 for use on exposed pipe lines, river crossings, etc. With this joint the end of the spigot

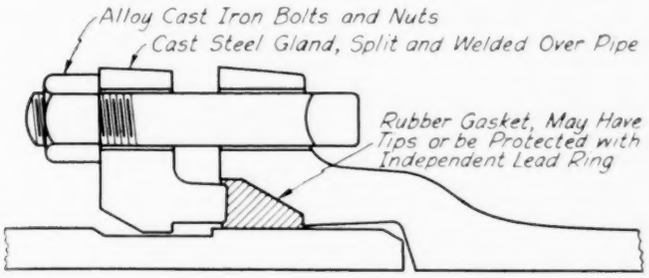

Alloy Cast Iron Bolts and Nuts
Cast Steel Gland, Split and Welded Over Pipe
Rubber Gasket, May Have Tips or be Protected with Independent Lead Ring

Fig. 5. Doublex simplex lock joint, a modification of Fig. 4.

piece is beveled at an angle of 45° and a groove is provided around the pipe for the gland lock edge. The cast steel gland is split and welded to form a solid ring around the pipe. This joint permits 2½° deflection and allows for a predetermined endwise joint movement for expansion and contraction. At the same time the joint is positively locked against endwise separation.

When assembling the joint in the field, it is essential that the joint surfaces be cleaned of any dirt or foreign matter. The rubber gasket should then be slipped over the spigot end with the large side next to the gland lip. All joint surfaces and the gaskets should be lubricated with heavy soap suds before inserting the spigot into the socket. The bolts are then tightened progressively and uniformly.

Fig. 6 shows the Molox ball and socket pipe, and also a joint of this type with double hubs. This joint has a spherical socket and a flange at one end, and a square bead on the spigot at the other end. A solid cast iron retainer ring, broken at one place, is stretched over the bead on the spigot to form a seat for a duck tipped rubber or other resilient gasket.

A cast iron split gland lip is next assembled on the spigot end of the pipe and the two halves are keyed together. This gland lip has a ball or spherical outside surface to engage the spherical inside surface of the gland. The spigot end of the pipe when assembled with joint materials has a spherical surface which properly fits and slides in the spherical socket and the inside surface of the gland.

The gland is telescoped to enclose the socket flange when the joint is tight. This telescoping feature not only provides protection for the bolts against corrosion, but also maintains the bolts free from shearing or bending stresses when the joint has deflected to its maximum position. The telescoping on the gland causes any side stresses imposed by the maximum joint deflection to be transferred to the socket flange. Glands are of cast steel and are machined where they telescope the pipe flange and engage the gland lip rings.

The cast iron retainer ring is definitely located in the socket. The spigot end of the pipe is free to move longitudinally through the retainer ring between the limits of the clearance at the bottom of the socket and the shoulder of the spigot bead. The joint, therefore, provides for pipe line expansion and contraction within predetermined limits. At the same time it is positively locked against final joint separation.

The bead and the spigot end of the pipe and the outside diameter of the flange are turned. The telescoping recess in the gland is bored. The gland is also bored when it engages the gland lip ring, and the bolt holes of the pipe are drilled. All other joint surfaces are as cast and are ground when necessary to insure the proper gauged fits.

Pipe is shipped from the foundry with the gland and all other packing materials assembled on the end of the spigot. These are wrapped in burlap and the whole assembly is secured to the pipe by means of lock bolts. The sliding contact joint surfaces are greased before shipment with a special lubricant which will not discolor or impart taste or odor to water.

When assembling in the field, it is essential that joint surfaces be cleaned and free from any dirt or foreign matter. If dirt or sand should get into the lubricant, the lubricant must be removed and the surfaces relubricated.

This joint provides for longitudinal movement caused by expansion and contraction of the pipe line. At the same time it is positively locked against joint separation and remains tight under pressures up to several hundred pounds per square inch at any angle within the range of deflection for which it is designed. The pipe may be laid directly from a barge for stream crossings, as the pipe and joint are sufficiently strong to support its own weight safely in water as a beam, even when four lengths of pipe are joined together. Therefore, it is possible to lay it in deep water without the use of divers. The maximum safe

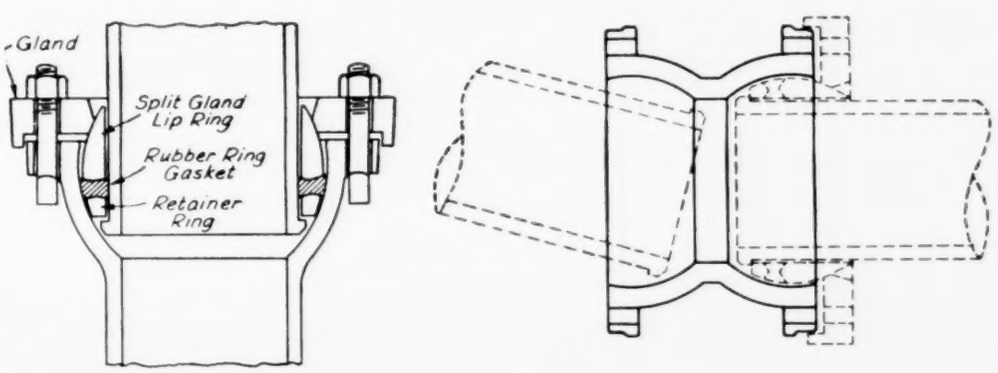



Fig. 6. Left, Molox ball and socket joint. Right, joint of same type but with double hubs.

end pull varies from 16 ton for 4 in. joints to 180 tons for 36 in. joints.

Joints with a deflection up to 15° can be made with single hub joints and up to 30° with double hub joints. Double hub joints are recommended for submarine lines larger than 24 in. dia. They may be spaced in multiples of 16 ft and are sometimes used in combination with the less expensive Doublex simplex lock joint pipe described previously.

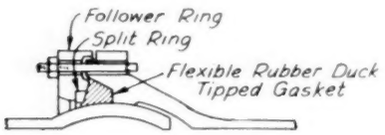



Fig. 7. Form of river crossing joint.

The river crossing cast iron pipe joint of Fig. 7 has a spherical shaped spigot piece with finished surface to ride on a raised surface at the bell end. A tight joint is made with a flexible rubber duck tipped gasket, a split ring or gland, and a follower ring which is pulled up with bolts to compress the gasket. A maximum deflection of 15° can be obtained with this type of joint. The split ring and gasket prevent opening up of the joint under tension.

The screw gland joint, Fig. 8, consists of a socket with helical shaped cast grooves and a triangular shaped stuffing box into which is fitted a plain spigot end. A cast iron screw gland, a fabric faced rubber gasket, and an independent lead ring are provided for making a tight joint.

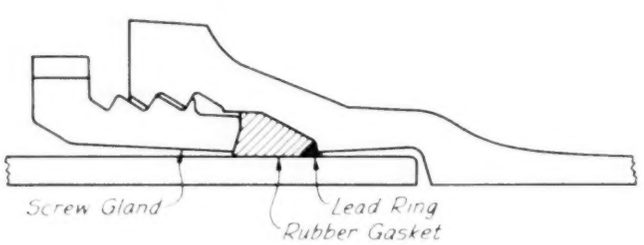



Fig. 8. Screw gland joint fitted with lead ring and rubber gasket.

When making this joint, the pipe socket, the spigot and the joint materials should first be wiped or brushed clear of all foreign material. Socket threads, gland threads, face of the gland lip, and the back of the gasket should then be painted with a special lubricant furnished by the manufacturers. The gland, gasket and lead ring are then assembled on the spigot in the order given and sufficiently far back to permit free entrance of the spigot into the socket. The gasket should be forced into the socket by hand punches, using a calking iron or small bar.

The lead ring will be pushed forward by the gasket, and the gasket should be forced to its seat all around, beginning at the bottom of the joint to facilitate centering the spigot in the socket. The gland should then be screwed up by hand, and tightened with a spanner wrench or other suitable tools. The gasket is faced with fibre to provide a free sliding contact surface with the gland lip when it is being tightened to compress the gasket.

The combination of plain rubber gasket and lead rings, which is standard for this type joint, provides an economical and effective all-purpose packing, suitable for water, gas, oil and other liquids. Asbestos gaskets, Thiokol tipped rubber and other special types of gaskets are available, if required.

The rubber is confined and under very high compression, a prime requisite for long life service.

Lubricant should be applied as follows:

For gas service, lubricate the gland threads; the face of the gland lip; the socket threads; the gasket seat in the bell; and the back of the gasket after it has been placed in the socket. For water service, lubricate the gland threads; the face of the gland lip; the socket threads; and the back of the gasket after it has been placed in the socket.

Deflection in this type of joint is provided for by the flared socket and gland. The gasket becomes the fulcrum point when the joint is deflected. The joint will deflect easily and will remain tight under pressure. The safe deflection with this joint, with 150 lb pressure, varies from 4° 9′ for a 3 in. pipe to 2° 4′ for 12 in. dia pipe.

This type of joint has been satisfactorily used in Europe for many years.

Parts for the Dresser Bellmaster No. 85 joint, Fig. 9, are:

(1) A Bellmaster unit consisting of an inner ring, gasket, outer-ring and a set of capscrews all factory assembled into a single unit.

(2) A special bell end with a groove on the inner circumference to take lugs on the Bellmaster unit. Slots are provided in the outer face of the bell. When assembling, the lugs on the Bellmaster unit are passed through these slots to the groove and the unit rotated until the lugs hit stops in the groove.

The spigot end is then stabbed in and the cap-screws tightened, thus drawing the inner ring closer to the locked outer ring, expanding the gasket against the outside of the spigot and the inside of the bell, making a tight seal against both.

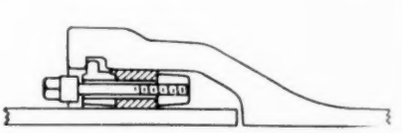


Fig. 9. Dresser Bellmaster No. 85 joint.

Plain rubber gaskets are furnished for natural gas and water, and armored gaskets can be obtained for manufactured gas or other services. Deflections from 8° 30′ for 4 in. pipe to 6° for 12 in. pipe can be safely used.

Joints for 2 in. cast iron pressure pipe are shown

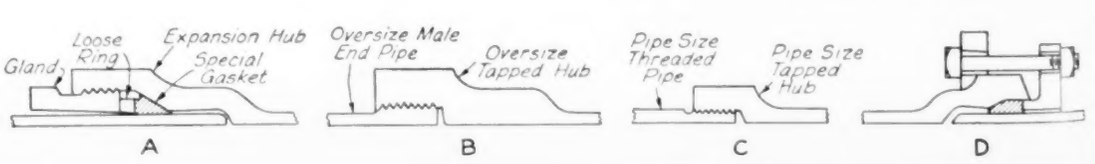



Fig. 10. Types of joints for 2 in. cast iron pressure pipe.

in Fig. 10*A*. This pipe is used for exposed or underground service where the pressure does not exceed the equivalent of 250 lb maximum working water pressure. Considerable flexibility can be obtained with pipe of this type. The Flexklamp joint, 10*D*, is fitted with rustproof bolts and with either composition rubber, asbestos or special gasket to meet particular requirements. All that is necessary in laying this pipe is to insert the spigot end and tighten the bolts. An expansion joint, Fig. 10*A*, should be provided at regular intervals.

Strapped joints, Fig. 11, are commonly used on plant fire mains or high pressure water mains at all changes in direction to prevent the joints from opening up under pressure. Tie rods should be thoroughly coated to prevent rusting out. Where possible, it is advisable to back up the joint with a block of concrete as tie rods will corrode, especially where cinder fill is used.

Joints with lugs, Fig. 12, are similar to those in Fig. 11, with the exception that lugs are provided on the pipe and fittings, thus making it unnecessary to use straps.

Universal pipe joints, Fig. 13, have been extensively used for over 30 years for water supply, fire protection, sewage disposal systems, gas lines and oil condenser lines. No gaskets or joint materials are required and the joint can be made by common labor without tools, except wrenches.

One end of the pipe has a tapered spigot and the other a tapered socket. Both spigot and socket are accurately machined to insure proper fit. Lugs are cast as an integral part of the pipe at each end, and after the spigot end has been inserted in the socket, the bolts are tightened till the joint is properly made up. The average exposure of machined surface when the joint is properly made up varies from 3/16 in. for 2 in. pipe to ¾ in. for 30 in. pipe. The normal permissible joint deflection angle varies from 4° for 2 in. pipe to 2° for 30 in. pipe, and the minimum radius of curvature at which the pipe can be laid varies from 90′ for 2 in. pipe to 175′ for 30 in. pipe.

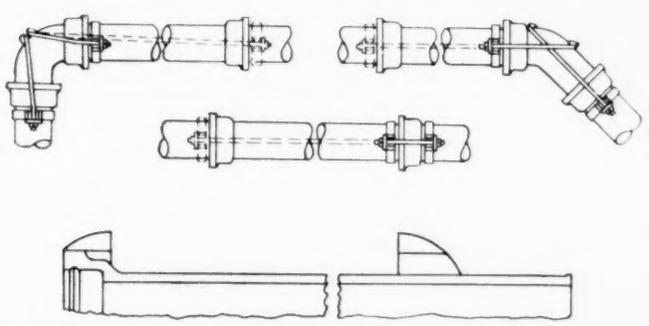
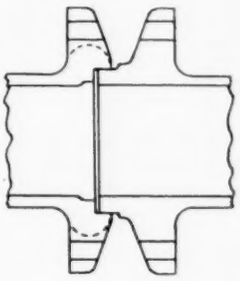


Fig. 11 (upper) Strapped joints commonly used on high pressure water or fire mains. Fig. 12 (lower) joints with lugs on pipe and fittings



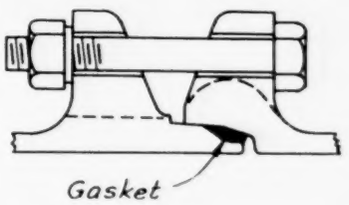



Fig. 13, left, Universal joint. Fig. 14, right, Dual-Lok joint.

The Dual-Lok joint, Fig. 14, is used for high pressure gas, oil and air lines and for sewage lines. This type joint is similar to the previous type except that it is equipped with a gasket which is compressed between the outside of the spigot piece and the socket. A special form of this joint is available for use with cement lined pipe and is specially suited for mine water drainage, acid lines, etc. All of the forms of Universal joint described withstand contraction, expansion, unequal settlement, vibration shock and electrolysis.

### References

For additional information on the types of joints shown in this article, the reader is referred to:

Handbook of Cast Iron Pipe by the Cast Iron Pipe Research Association.

Cast Iron Pipe by The Warren Foundry and Pipe Corp.

Pipe Economy by James B. Clow and Sons.

Bulletins of the American Cast Iron Pipe Co. and The Central Foundry Co.

## Heated Pipe Coil Saves Freezing-Room Floor

A new food-freezing plant and a dairy, both in Pennsylvania, have been equipped with a unique modification of radiant heating to prevent concrete floors from buckling and insulation from disintegrating in freezing rooms and refrigerated storage rooms. Essentially the same problem was involved at the Adams Apple Products Corp., Aspers, Adams County, Pa., and the Penn Dairies, Inc., Lancaster.

In the main freezing room in the Adams plant, the structural floor slab, a layer of insulation and the finish floor slab each are 6-in. thick. In the structural slab, ¾-in. wrought iron pipe coils were buried during the early stages of construction. The pipes are in the form of a grid and spaced on 36-in. centers. Similar installations are in the freezing storage room having temperatures ranging from 0 to —5F, and a freezing tunnel with —30F temperature.

Instead of using water protected by anti-freeze compounds, the designers selected No. 2 fuel oil as the heating medium that is circulated through the coils. The oil is heated to about 40F in a small heat exchanger connected to the plant steam lines. The designers estimate that the heat output is sufficient to prevent freezing of the insulation, even when the temperature is reduced to —30F in the rooms. The heat from the coil does not penetrate the finish floor slab, however. Systems in both the dairy and food plants are essentially the same.

# Graphical Determination of Heat Transfer Film Coefficient for Sulfur Dioxide Vapor

B. F. RABER* and F. W. HUTCHINSON**

Continuing the heat transfer film coefficient series, this article presents graphical solutions for non-condensing sulfur dioxide vapor flowing turbulently within, or outside and normal to, a single pipe. These solutions complement the two for liquid sulfur dioxide which appeared in an earlier installment.[1]

Fig. 25 and 26 are, respectively, for film coefficients of heat transfer between the main body of the fluid and the inside surface of the pipe or between the main body of the fluid and the exterior pipe surface. When the weight velocity of flow (product of weight density and fluid velocity) is known and with the diameter of pipe and mean fluid temperature also known, the graphical solutions permit direct determination (as shown by the dashed example lines) of the two film coefficients. In contrast with the solution[1] for liquid sulfur dioxide flowing inside a pipe it is interesting to note that for non-condensing sulfur dioxide vapor (that is, vapor which is being superheated or desuperheated, but not undergoing phase change) the film coefficient is the same irrespective of whether the vapor is gaining or losing heat; hence Fig. 25 could be used either for investigation of energy transfer *to* vapor in the line between the evaporator and compressor of a refrigeration system, or for energy transfer *from* vapor in the compressor-condenser line.

Fig. 25 is valid for turbulent flow of sulfur dioxide vapor at pressures below 50 lb per sq in. abs, but for 100 lb per sq in. abs it is invalid if the vapor density is less than 1.5 lb per cu ft and for 150 lb per sq in. abs it is invalid for vapor densities less than 2.0 lb per cu ft. Fig. 26 is for turbulent flow also and is valid for all weight velocities in excess of 1 lb per (sec.) (sq ft); for lower values than this the Reynolds criterion of turbulence must be investigated; cases requiring such a check will not normally occur in the range of practical design, but if such a case is found, an approximate check on the Reynolds criterion would be to determine that the product of weight velocity by pipe diameter (in feet) divided by the viscosity of the vapor (in lb per (ft) (hr)) is greater than 100.

*Example:* Superheated sulfur dioxide vapor at 70 lb per sq in. abs and 150F (specific volume of 1.389 cu ft per lb) is cooling as it flows through a very thin-walled copper tube having inside diameter of 1 in.; the velocity of the vapor is 32 fps. A stream of superheated sulfur dioxide at 60 lb per sq in. abs and 100F (specific volume of 1.288 cu ft per lb) is flowing outside and normal to the same tube at a velocity of 29.5 fps. Neglecting thermal resistance of tube wall and taking outside diameter equal to inside, calculate the rate of heat transfer per lineal foot of tube.

*Solution:* The weight velocity of the vapor within the tube is the product of velocity by weight density or 32 (1/1.389) = 23 lb per (sec.) (sq ft). The weight velocity outside the tube is 29.5 (1/1.288) = 23 lb per (sec.) (sq ft). The inside film coefficient is obtained by using Fig. 25, entering the weight velocity scale at 23 and rising vertically to intersection with the horizontal for 1 in. outside diameter then following the directrix lines up and to the left (see dashed example line on the figure) to intersection with the horizontal scale. From this point rise vertically to the horizontal marked 150F (note that for sulfur dioxide the temperature line has the same position whether the vapor is being heated or cooled) and from this intersection move downward and to the right paralleling the directrix lines to intersect the horizontal scale at a value of the inside film coefficient of slightly less than 25 Btu per (hr) (sq ft) (F) temperature difference between the main fluid body and the inside pipe surface.

The outside film coefficient is obtained from Fig. 26 by a similar procedure (see example line on the figure), the value being 22 Btu per (hr) (sq ft) (F). Comparison of the temperature lines of the two figures shows that the influence of temperature is substantially greater in the case of vapor outside the pipe.

The inverse of a film coefficient is the film thermal resistance hence the respective inside and outside film resistances for the tube in question are 1/25 = .04 and 1/22 = .0455 and the overall resistance from the main body of vapor inside to the vapor outside (neglecting the resistance of the thin copper wall) is .04 + .0455 or .0855; the overall coefficient of heat transfer is therefore 1/.0855 = 11.7 Btu per (hr) (sq ft) (F) temperature difference between the inside and outside vapors. The temperature difference is 150 − 100 = 50 so the rate of heat transfer per square foot of tube surface is 50 × 11.7 = 585 Btu per hr. The surface area of one lineal foot of tube is 3.1416 12 = .262 sq ft hence the rate of heat transfer per lineal foot of tube is .262 × 585 = 153 Btu per hr.

The temperature change of the vapor in the tube can be calculated by finding the weight of vapor passing the cross-section in an hour. Thus with tube area of 3.1416/(4 × 144) = .00545 sq ft the actual weight rate is .00545 × 23 × 3600 = 451 lb per hr and the reduction in internal energy of each pound of vapor is therefore 153/451 = .34 Btu per lb for each lineal foot of tube. The specific heat of sulfur dioxide vapor at 70 lb per sq in. abs and 150F is approximately .24 Btu per (lb) (F) hence the temperature change of vapor within the tube is at a rate of .34/.24 = 1.4F per lineal foot of tube.

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**Professor of Mechanical Engineering, University of California and Consulting Professor of Mechanical Engineering, Purdue University.

[1]Graphical Determination of Heat Transfer Film Coefficient for Sulfur Dioxide, HEATING AND VENTILATING, February, 1945.

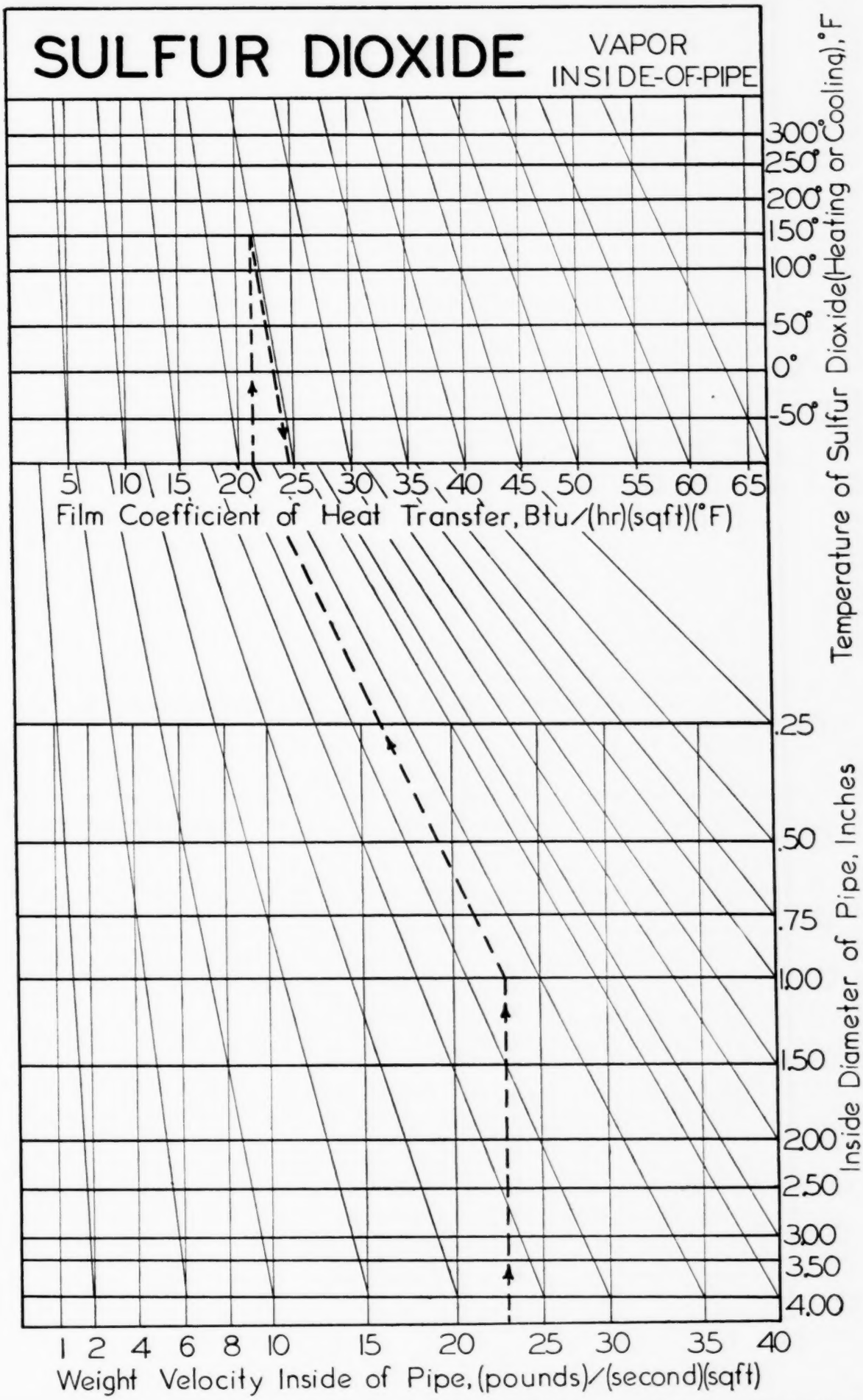


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**Fig. 25. Film coefficient for sulfur dioxide vapor flowing inside a pipe.**

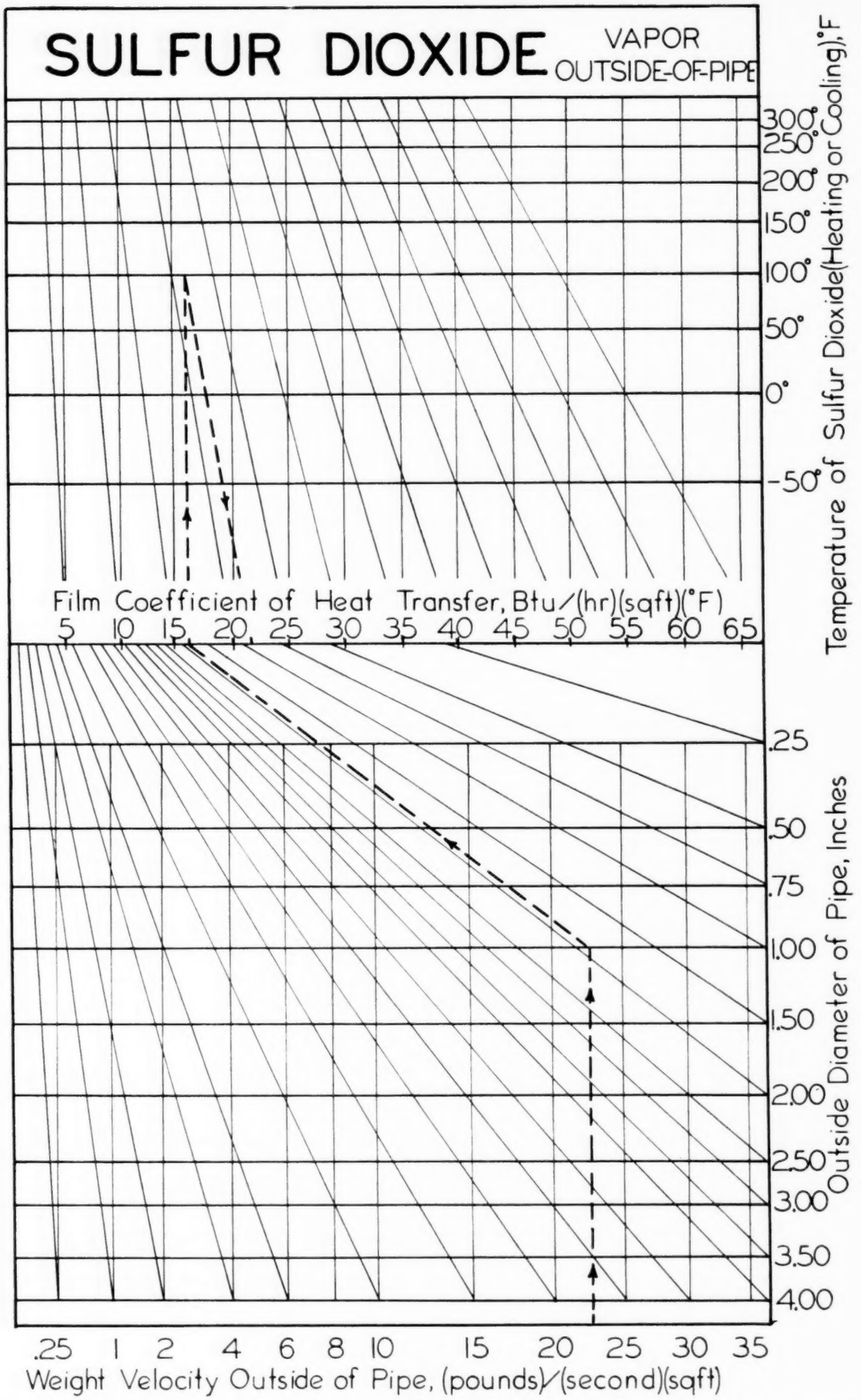
SULFUR DIOXIDE
VAPOR
OUTSIDE-OF-PIPE
Film Coefficient of Heat Transfer, Btu/(hr)(sqft)(°F)
5 10 15 20 25 30 35 40 45 50 55 60 65
Temperature of Sulfur Dioxide(Heating or Cooling),°F
300° 250° 200° 150° 100° 50° 0° -50°
Outside Diameter of Pipe, Inches
.25 .50 .75 1.00 1.50 2.00 2.50 3.00 3.50 4.00
.25 1 2 4 6 8 10 15 20 25 30 35
Weight Velocity Outside of Pipe, (pounds)/(second)(sqft)

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Fig. 26. Film coefficient for sulfur dioxide vapor flowing outside a pipe.

# RADIATOR ENCLOSURES AND PLACEMENT OF RADIATORS

ALTHOUGH a number and variety of tests have been conducted on radiator enclosures, and the results published, there is still confusion in the minds of many heating engineers as to the effects of enclosing radiators. The purpose of the accompanying information is to summarize the findings of investigators at the University of Illinois who studied this matter and reported on it in two publications of the University of Illinois Engineering Experiment Station, Bulletin 192 and 223. These appeared under the authorship of Arthur C. Willard, Alonzo P. Kratz, Maurice K. Fahnestock and Seichi Konzo. The latter bulletin also included some valuable data on the more or less related subject of radiator placement.

In earlier studies the "efficiency" of a radiator was measured simply by measuring its steam condensing ability. The Illinois investigators correctly concluded that the important point was to determine the steam condensing rate when air temperatures were held at a comfortable point in the living portion of the room. A radiator which condensed a large quantity of steam but which produced a high ceiling temperature and low temperature near the floor was not judged to be so good as one with lesser condensing rate but which gave a more desirable air temperature gradient.

The Illinois tests were all run on steam radiators; hot water was not, at the time, so popular as now. The findings with low temperature hot water might have been different from those with steam, but it seems reasonable to believe that there would be little variation between the results with steam and with higher temperature hot water closley approaching steam temperatures.

The accompanying table summarizes the results with various types of enclosures. Note that a simple shelf gave better results than an unenclosed radiator. It would appear that the deflection of the convection currents improves the temperature gradient, and it also seems that the back of the enclosures prevents the loss of a fair amount of radiant energy from the radiator to the cold wall in back. The front of the enclosure must have a fair ratio of free area to total area, but just what the ratio should be was not reported.

The investigators concluded that:

"(1) The use of a properly designed enclosure or shield on a tubular or column type of radiator results in a gain in steam economy, and equally or more satisfactory air temperature conditions in the room as compared with those obtained by the use of the same radiator unenclosed.

"(2) The use of an improperly designed enclosure on a tubular or column type of radiator results in a reduction in steam condensation and in unsatisfactory air temperature conditions in the room as compared with those obtained by the use of the same radiator unenclosed.

"(3) The condition mentioned in conclusion (2) may be partly corrected by sufficiently increasing the size of the enclosure and radiator. It is possible to obtain practically as satisfactory room temperature conditions as those obtained with the smaller unenclosed radiator, and slightly greater steam economy.

"(4) A properly designed enclosure or shield should offer a minimum of resistance to the flow of air over the radiator under gravity head, and should protect the wall back of the radiator against the effect of direct radiation from the radiator. It should have the top of the opening in the face of the enclosure as high as possible, and permit free access of air over the lower half of the radiator, especially near the floor.

"(5) The use of an enclosure having clearance between the radiator and the back of the enclosure reduces the temperature of the wall surface back of the radiator approximately 45F below that obtained with an unenclosed radiator.

"(6) The use of an enclosure with a galvanized back, or one painted with metallic bronze paint, reduces the temperature of the wall surface back of the enclosure from 10 to 25F below that obtained with an enclosure with the back painted with oil paint. In this respect galvanizing is slightly more effective than gold or aluminum bronze."

Included in the Illinois tests were wall radiators, which gave good results under the window. Nothing was gained by enclosing wall radiators, however, and when the wall radiator was placed near the ceiling the results were exceedingly poor. Tests with long, low and thin radiators as contrasted with short, high and thick radiators, both in different locations, led to the following conclusions:

"(1) Long, low, thin cast-iron radiators placed under windows heat a room more comfortably and more economically than higher column or tubular radiators similarly placed.

"(2) Long, low, thin cast-iron radiators maintain materially better floor to ceiling temperature differentials than high column or tubular radiators.

"(3) The larger portion of the temperature differential in a room heated with direct steam cast-iron radiators of the column and tubular types occurs between the floor and the breathing level.

"(4) The temperature used as an indication of whether a room is properly heated or not should be observed at some level nearer the floor than the breathing level. The 30-in. level is tentatively suggested as more representative of conditions in the zone of human occupancy.

"(5) No material gain in economy or room temperature conditions may be realized from the use of an enclosure or shield on a wall type of radiator.

"(6) Increasing the size of an enclosed or an unenclosed radiator results in a uniform increase in the room temperature at all levels in the room, and an increase in the steam condensation. The steam condensation, however, increases at a greater rate than the increase in indoor-outdoor temperature difference, and it is not safe to predict the steam condensation for one size of radiator from the room temperature gradient curves and steam condensation for another size.

"(7) Both steam condensation and room air temperature conditions are affected by the location of the heating unit. In general, the location under a window in the exposed wall is to be preferred to a location near an unexposed or warm wall.

"(8) The location near the ceiling is a most unfavorable location for a radiator and is not to be recommended."

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# RADIATOR ENCLOSURES AND PLACEMENT OF RADIATORS

SUMMARY OF FINDINGS AT UNIVERSITY OF ILLINOIS ON RADIATOR ENCLOSURES

| Enclosure No. | Description of Enclosure | Steam Condensed, % of Bare Unenclosed Radiator | Remarks |
|---|---|---|---|
| — | None | 100% | — |
| 1 | Simple shelf or shield over top of radiator | 88.4 | More advantageous than unenclosed radiator because, with less steam, it maintained slightly higher temperature below breathing level than did unenclosed radiator while floor temperatures were same. Ceiling temperature lower with shield. |
| 2 | Rather high legs, giving easy air flow to radiator at base. No outlets on top or ends. Outlet in front extended about halfway down front with high ratio of free area. Outlet in form of long slots. | 90.0 | Maintained higher temperature at breathing level and in living zone than with plain radiator while floor and ceiling temperatures were about same, and with less steam. Hence, enclosure is superior in comfort and economy to unenclosed radiator. |
| 3 | Legs not so high as No. 2. No top opening, but open on ends as well as front. Grillework of staggered metal rods with good ratio of free area to total grille area. | 86.6 | Relative to unenclosed radiator, maintained same temperature at breathing line, lower ceiling temperature, higher floor temperature and materially higher temperature in living zone. In view of this and economy, this is most satisfactory of enclosures tested. |
| 4 | Cloth cover over top and extending down 6 inches from top | 84.5 | Produced entirely unsatisfactory air temperature conditions. Not recommended. |
| 5 | Solid top, grilled front and ends with small free area | 86.0 | Better air temperature conditions and steam economy than with no enclosure but not so good as No. 3. |
| 6 | Cloth cover, 12 inches. | 67.5 | Impossibly low temperature at breathing line, worse than No. 4. Not recommended. |
| 7 | Cloth top, no front, 6 inch ends, back extended to floor | 86.0 | Reduction in steam condensed but also a reduction in floor and breathing line temperatures. Not satisfactory and not recommended. |
| 8 | Solid hinged top and ends, grilled front with rather large free area. | 87.9 | Low temperatures near floor. From this standpoint, not so satisfactory as unenclosed radiator when top was lowered. With top raised, results were more satisfactory than unenclosed radiator. |
| 9 | Quite open grillework in front and on curved ends, closed top | 89.6 | Unsatisfactory, due to low floor temperatures. |
| 10 | Solid top and ends with outlet having gross area of about one-third of front but with good free area | 82.7 | Failed to heat room. |

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# Answers to Questions Frequently Asked Regarding Radiant Heating

R. G. VANDERWEIL

**Concise answers to questions that were most often asked at technical meetings and panel discussions.**

THE author has participated in many panel discussions or symposiums on radiant heating before engineering or technical groups. Questions most frequently asked at these gatherings and the answers to the queries are here presented. They are arranged under four general headings in order to establish some coherence to the many questions.

## Radiant Heating and the Conventional System

**What is radiant heating, and how does it compare with the conventional system?**

Radiant heating is a comfort heating system designed to check the heat losses of the human body. The room's occupant loses heat by radiation and convection and both components are equally well checked by panel heating. The conventional heating system checks primarily the body heat loss by convection.

**What are the differences in performance of radiant heating and the conventional system?**

Radiant heating operates with large heating surfaces of low temperature; the conventional system with small heating surfaces of higher temperatures. The step from radiator to heating panel much resembles the step taken many years ago from pot-belly stove to radiator. Both changes cited similar results: greater heated areas, smaller temperature of the heated surface and better strategical location of the heating surface. In both cases, the aim was achievement of better comfort by:

(a) Creating more even air temperatures.

(b) Suppressing drafts.

(c) Avoiding "burning" of organic and dust particles suspended in the air.

(d) Creating more even temperatures of the room surfaces.

**What is the installation cost of radiant heating, as compared with other systems?**

This is one of the most controversial questions in connection with radiant heating. The author knows of installations where the erection cost considerably exceeded that of conventional systems, but also of others where such systems were abandoned in favor of radiant heating, which proved of better economical value.

The question of relative cost should be carefully studied in each individual case. It is not only influenced by the building heat losses and the selection of floor or ceiling system, but even more so by the type of structure and method of erection. Quite generally speaking, radiant heating will prove less costly where coils can be embedded in media of high thermal conductivity, and where one coil delivers considerable heat in both directions, up through the floor and down through the ceiling.

**What is the fuel consumption of a radiant heating system, as compared with others?**

We have heard of numerous statements "that radiant heating would save 25% of the annual fuel bill," but such statements cannot be backed by theoretical computations. Small fuel savings, possibly in the order of 10%, seem likely and have been recorded by comparison of buildings of similar size and construction. However, an accurate figure cannot be given unless two identical homes, on identical locations, have been tested throughout several heating seasons. The lack of stratification in radiant heating systems partly explains small fuel savings.

## Physical Properties of Radiant Heating

**Must heating coils be in direct contact with cement or plaster, or will a coil located in a dead air space deliver heat?**

A coil hung in an air space delivers heat in both directions, up and down. The amount of heat delivered depends on the insulating properties of the ceiling below and floor above the air space, and in some cases, may be sufficient to heat the rooms. Since the air layer surrounding the tube and pipe represents a considerable thermal resistance, all systems with suspended coils operate on higher water temperatures and generally on closer pipe spacings or larger pipe diameters than systems with embedded coils. Copper tubes used in air spaces must be painted dull.

With embedded coils, the pipe diameter is of small influence upon the heat output; with suspended coils, this output increases considerably with the diameter. In general, suspended coil installations are more costly than those using coils embedded in building materials.

**Is it possible to use the ceiling panel of the first floor to heat the second floor?**

Heat flow in both directions—up and down—is not only possible, but necessary. Since there is no perfect insulator, some heat must flow upwards from the ceiling coils, even with the most effective insulation. This heat flow in the opposite direction is designated as "panel heat loss" and may or may not be usefully applied. Under certain conditions, such as with coils in concrete slabs, the heat loss upward may equal the ceiling panel output. Although such conditions in-

fluence favorably the erection cost, the temperature of the room above will be greatly influenced by regulation of the coil below which must be considered in the design of the system.

**How great is the heat loss of a panel in the opposite direction?**

As indicated in the preceding answer, this loss varies considerably with the quality of the opposite panel insulation. It also varies with the temperature of the opposite space. Most commonly, heat losses remain within the limits of 10 to 25%. Extreme cases, however, may deviate greatly. The solid concrete slab discussed in the previous question may have losses equal to the output. The magnitude of the heat losses of a floor panel erected on a damp and highly conductive ground can be excessive, particularly in small buildings. Then again, ground floor losses of large industrial structures on dry ground of good insulating qualities may be as small as 5 or 10%. The losses of well insulated ceiling panels are equally small. Panel heat losses should not be assumed, but computed according to one of several available methods.

**Is heat lag a problem with radiant heating systems, and what are its causes and remedies?**

Heat stored by a radiator or convector is relatively small. Not so, the heat stored in a suspended ceiling or even more in a floor slab. The heat lag, if not properly compensated for, may influence the room temperature and considerable research is being carried out by colleges and control manufacturers to provide the proper controls for each type of radiant installation. Room temperature is not only influenced by the heat lag of the panel proper, but also by that of the building's walls and the variation of water temperature, all of which are considered by control manufacturers.

In spite of, or possibly due to these mutual relations, numerous ceiling systems are known to work satisfactorily with simple room thermostats. More commonly met, particularly with floor installations, are controls using by-pass and additional outdoor bulb.

**How influential is radiation shadow?**

Spaces under a desk or table cannot be heated by radiation from the ceiling directly above. Generally, these spaces are so small that sufficient heat is supplied by convection and re-radiation from the surrounding floor area. Also, heat is supplied from parts of the ceiling not directly above the space considered, and the combined effect of this radiation and the re-radiation and convection from the floor, make the shadow a half shadow. Analogy: The space under a table is not dark, but is lighted by reflection from the surrounding walls, even if the source of light is concentrated and located directly above the table.

**What are the highest allowable panel surface temperatures?**

Temperatures still considered comfortable by the occupant are the highest allowable. With floors, the maximum allowable temperature changes with the type of occupancy. Continuously occupied spaces should operate with floor temperatures of 85F or less. Temporarily occupied spaces, and only such spaces, may go up to 90F or even higher—if the floor cover remains undamaged—since such temperatures are not of disturbing influence where the occupant remains on the hot surface for only a few hours per heating season. Example: Sales area of a drug store.

On ceilings, the maximum allowable temperature changes with the ceiling height. Generally, 100F is considered a maximum for 7 ft ceilings and 10F are added for each additional foot. Thus, the maximum temperature of a 9 ft ceiling is 120F. With coils embedded in plaster, 130F is considered as maximum ceiling surface temperature.

**Can all kinds of floor covers be used in connection with floor heating panels?**

No, but all most commonly used types can serve. The conductance of the material layers between coil and floor surface must be great enough to allow the use of an operating water temperature lower than 210F. For instance, where tubes are embedded in floors covered by wood blocks higher than 2 in., excessive water temperatures would be met. However, practically all of the commonly met floor covers and structures are of a conductivity great enough to result in practicable water temperatures. One of the most unfavorable structures, double wood flooring on concrete, will call for a mean operating water temperature of approximately 170F if proper surface temperature restrictions (85F) are made.

**Is the following statement correct: Any pipe coil, no matter what its physical dimensions and properties, will work if embedded in concrete floors?**

This statement has been made repeatedly and must be repudiated. This is what may happen with arbitrarily built heating coils:

(a) Overheating of entire floor area.
(b) Formation of local hot spots.
(c) Loosening of mastic under linoleum.
(d) Cold floors and no heating at all.
(e) In extreme cases, freezing of coil.
(f) And many other smaller nuisances, such as air-bound coils, etc.

Hence, heating coils should be designed!

**How about the boiler size with radiant heating?**

According to the most common computation methods, the building heat losses are figured according to standard methods. The boiler size may be found, as with conventional systems, by adding to the sum of all panel heat requirements, the piping losses and extra capacity for domestic hot water generation.

**Are vent problems more apt to occur with radiant heating than with other systems?**

Yes. Air more readily deposits in long level heating coils than in radiators and may cause trouble where the coil return is connected to a return header below. This is particularly true where the flow velocity of the down riser is low. In such cases, air is trapped at the coil outlet. Remedy: Cooperate with nature's laws. Air bubbles rise in water, hence, locate the return header above the heating coil. Then air must

escape through the return riser as the pump is started. The return header obtains an automatic vent at its high point where it is also connected to the pump suction flange.

**What type circulators are selected? Shall we use sinuous or grid coil?**

According to the author's opinion, it is favorable to select pumps of higher head, particularly where these are available within the same price range and equal horsepower requirements as standard circulators. This is the case with pumps of small delivery. High head pumps are of advantage for the following reasons:

(a) It is natural to select greater heads with radiant heating than with conventional systems, since piping pressure drops are of equal magnitude in both types of systems, but the coil pressure drop of the radiant heating system is considerably in excess of the drop in a radiator or convector. In fact, the coil pressure drop is of a magnitude comparable to that of the entire pipe distribution system.

(b) With ferrous, as well as with copper piping, it is desirable to increase the coil area to a maximum. This relieves the design restrictions and results in equally good, and often less costly, coils.

(c) Sometimes, it is suggested that grid systems be used in connection with low head pumps. However, except for special cases, the grid system is by no means superior over the coil system. The flow through the individual grid circuits cannot be properly controlled and heating surfaces of uneven temperature may result.

**What water temperature drop is recommended in the radiant heating coil?**

According to the author's opinion:

(a) This drop should be 30F in all ceiling panels except those where tubes or pipes are embedded near the ceiling surface of a concrete slab, plain or linoleum covered. Such a system should be designed for a 10 to 15F drop.

(b) In all floors, except those with wood floor cover, use 10 to 15F. The latter should operate with a 30F drop.

Greater temperature drops are desirable for the same reason as greater pump head, namely, in order to provide for longer coil circuits. Furthermore, they are desirable inasmuch as they provide us with an economic means of concentrating heat release near the outside walls, or wherever required. However, the temperature drop is restricted wherever small changes of water temperature cause considerable changes of floor surface temperature and thereby discomfort. Hence, water temperature drop is small in most concrete floor panels.

**In placing the coils, is it necessary to provide extra radiation at the north wall?**

No. A well and economically designed system should employ as heating surface only one room enclosure—either ceiling or floor. However, exceptions are met, such as with excessive losses of rooms having large, single panel picture windows, where it may be advisable to add complimentary heating surface near the glass, either on the floor or on the ceiling.

**Can radiant heating be combined with domestic hot water generation?**

Yes. By means of a by-pass or other equipment, mixing some of the hot boiler water (180F) with the heating return (e.g. 90F) will supply the coil with water temperatures (e.g. 125F) as required by outdoor conditions. The by-pass is often regulated by an outside thermostat.

**Can a single coil satisfy the comfort conditions of a small home?**

No. Not only the individual room heat loss calculations are "an approximation" at the best, but also they do not generally consider room heat gains by sun, kitchen equipment, etc. In order to obtain even temperature distribution in all rooms, each room should obtain a balancing valve to regulate the coil heat supply according to individual conditions.

## Structural Questions

**Should floors be insulated in basementless homes?**

Where possible, yes. This may cut down your floor panel's heat loss to 25% or less and will guarantee warm floors with ceiling panels—even if no coils are embedded in the floor. Sufficiently high fill below the floor may be considered as proper insulation when provisions are made to keep this layer dry throughout the year. Due to its better insulation qualities, cinder fill is preferred, but it should not be used where floor coils are embedded directly above. Only in large buildings floor losses must not be considered as essential.

**Should extra heavy insulation be applied on buildings heated by means of radiant heating?**

No. No more insulation is required for radiant heating than for any other heating system. In fact, an improperly insulated home, which will be considered frequently as uncomfortable because of its prevailing low wall surface temperatures, will result in greater comfort when radiant heating is installed. This system will, to a greater degree, heat the inner surface of the outside wall. However, two factors should be considered:

(a) Install ceiling systems only, in homes of less than fair insulation in order to avoid excessive floor outputs and overheated floors.

(b) Consider that insulation frequently pays for itself by considerable fuel savings.

All arguments given for insulation hold true for double sash.

**Can ventilation be applied to radiantly heated rooms?**

Yes. In fact, radiant heating, and particularly ceiling heating, is of great advantage where high rates of ventilation are called for. The reason for this is that comfort may be found not only in rooms of 70F ambient and 70F MET, but also in rooms of 55F ambient and 85F MET. Hence, in a radiant heating system, properly designed to take into account a large air change, rooms can be operated with low air temperature, and its inherent higher relative humidity.

Considering a mean outside temperature of 40F throughout the heating season, a system thus designed will save half of the fuel required for ventilating purposes. Expressed, in other words — when replacing conventional heating by radiant heating, for the condition described, the rate of air change may be doubled without causing an increase of the annual fuel bill. Because of the extra favorable atmospheric conditions met with such systems, they should be applied where possible to hospitals, and particularly to tuberculosis institutions.

**Is damage caused by difference of expansion of copper in concrete or iron in plaster?**

No. Not with systems installed according to the several well-known installation practices. These practices should be adhered to, and care should be taken that proper concrete and plaster mixtures are applied. Actually, differences in expansion are met with any two materials used in conjunction. However, these differences are slight and result in stresses in masonry and tube materials of such small magnitude that they are readily absorbed by the materials in question.

**Do heating panels cause cracks or streaks in ceiling surfaces?**

No, not with systems installed according to recommended installation practice. Naturally, hair-line cracks often encountered on standard ceilings, occur also with radiant heating systems.

**Can I take my winter vacation if my home is heated by radiant heating?**

Yes, if you also insist on a properly designed system. Such a system (like any other properly designed system) should drain completely and generally from one location. Where the coils are sufficiently level and the piping designed appropriately, it is by no means necessary to employ compressed air to drain the system. Sometimes, anti-freeze solutions (non-alcoholic) are recommended. If you do not drain your plumbing, when you start on your vacation, turn the room thermostat to its lowest setting (which should be 45F, but more likely is 55F) and continue operating the system.

**Can we use radiant heating to dry a home in construction?**

No. Not unless special provisions are made. These are: With floors or ceilings, turn on heat only after concrete or plaster is properly cured. In order to dry the plaster by radiant heating in homes built during the winter period, cases are known where plaster was applied first to the walls only, and the ceiling coils were heated with high temperature water. After the walls were cured, plaster was applied to the ceiling coil, which was then heated by water of approximately 60F temperature throughout the curing period.

**How can I make sure that no leaks will occur in my ceiling or floor coils?**

By insisting on the proper hydraulic coil pressure test, as recommended by the tube or pipe manufacturer and by avoiding contact of coil with corrosive substances, such as cinders. Generally, the material surrounding the coil protects it from corrosion. An additional safety measure is used by some contractors. The coils are connected to city water during the entire building period. If the piping should be damaged, this will be noted immediately.

## Physiological and Comfort Questions

**Supposedly, radiant heating can operate with lower temperatures than other systems. Why?**

Because the human body loses heat by radiation to walls, ceilings, etc. and by convection to air. If the body heat loss by radiation decreases due to higher temperatures of the room's enclosures, as met with in radiant heating, then the loss by convection must increase in order to maintain constant the total heat loss of the human body. The convection loss can be increased only by use of lower air temperature.

**Can I minimize the dust problem with radiant heating?**

Radiant heating, by its mere nature, minimizes the dust problem. There are no hot surfaces forcefully circulating the room's air and depositing the dust above at the walls or on the curtains. In ceiling systems particularly, there are no air currents to keep in suspension dust particles whirled up from carpets and other floor covers. Floor radiant heating reduces the dust problems; ceiling heating eliminates it.

**How about this "refreshing atmosphere" claimed for radiant heating?**

It is hard to make statements relating to the unmeasurable quantity called "refreshing." Possibly the only ones to investigate this problem were the English. According to a representative of a well-known English heating firm, an investigation was made in two practically identical office buildings during the last World War. The white collar workers in both buildings were tested for fatigue, and it was found that its early signs appeared 1½ hours earlier in the conventionally heated building than in that heated by ceiling panels.

**I like warm floors. Why do you recommend ceiling panels?**

I like warm floors myself, but I do not like to get the "hot foot." Let us remember it is bothersome to spend many hours on an overheated floor—and very comfortable to spend same hours on a warm floor. Furthermore, I do not recommend ceiling panels only. For many installations, such as industries, garages, etc., the floor panel is the logical and correct solution. Also, where well insulated homes are built, the floor panel will give you satisfaction. However, if you find your floor loads are high, omit further complications and use ceilings. And wherever your building-project's comfort is a factor important enough to warrant small additional expenses, I would suggest that you investigate ceiling panels. For millions of years, the human body has received its radiation from the sun above and it seems a natural that warmth is more readily obtained by the upper extremities of a skin temperature of 86F than by the lower extremities having a skin temperature of 76F.

# Higher Court Decisions Affecting Heating Contractors

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**In this review of some recent court decisions selected to direct the heating contractor to important court interpretations, Mr. Parker points up the recently accelerated frequency of civil suits involving heating equipment and emphasizes the importance of familiarity with higher court precedents.**

IT is not often that higher courts have occasion to decide so many important law suits affecting heating contractors as have been rendered recently. We shall briefly review these important cases. Readers who desire complete details of any case may identify and read the complete decision in any good library by refering to the citations.

### Why Appeal?

Modern higher courts consistently hold that litigants should not appeal to a higher court if the amount involved is small and insignificant.

For example, in Standards Heating Company v. Reichert, 25 N. W. (2d) 87, reported January, 1947, the facts are: On January 11, 1945, a written contract was entered into by the Standard Heating Co. and a property owner named Reichert under the terms of which former was to "Install Janitrol gas conversion burner in present cast iron hot air furnace with chimney liner and thermostatic controls according to city code". The contract price was $240. On February 7, two mechanics were sent by the Standard Heating Co. to Reichert's home to make the required installation. They found it necessary to tear down the furnace, and then discovered a small crack in the shovel plate which might result in the escape of dangerous gases into the home. This was explained by Standard Heating Co. Reichert stated that he was undecided whether he would have the crack repaired or order a complete gas unit. Shortly thereafter the property owner, Reichert, purchased from another heating concern an entirely new unit, which included a new furnace.

### Sued

The Standard Heating Co. sued Reichert to recover damages for breach of his contract. The lower court held Reichert liable to Standard Heating Co. for only $75.

Reichert appealed to the higher court which promptly approved the lower court's verdict, and said:

"Counsel must have known that even if his client were to prevail nothing would be gained in a financial way, and that was the only thing involved. To encourage or even to permit appeals of this type is no help. . . . Cases like this create bitterness and hostility. and the prosecution of them is likely to intensify rather than lessen such a feeling."

### Breach of Contract

According to a recent higher court a contractor who breaches a contract must stand the full consequences. The only testimony that will assist a contractor who breaches a contract to recover payment from a property owner, is definite proof that the property owner is at fault.

For instance, in A.B.C. Oil Burner & Heating Co., Inc., v. Palmer, 28 So. (2d) 462, reported March, 1947, it was shown that a contractor installed air conditioning equipment under a guarantee that it would be satisfactory to the property owner. The evidence showed clearly that the failure of the unit to produce the cool air guaranteed by the contractor was not due to any fault of the machine or because it was not large enough to accomplish the desired result. In fact, the evidence made it plain that the failure of the unit to perform in accordance with the contractor's guarantee was due entirely and exclusively to an inadequate water temperature and supply.

The higher court held that the contractor breached his contract because it was his duty to know that the temperature of the water, and the water supply, was such that the apparatus would effect satisfactory results, and comply with the terms of the guarantee.

During the course of the controversy the property owner moved the main part of the equipment, the cool-

ing unit, to another building where he had it installed.

The higher court held that the property owner must pay the contractor the value of the unit, and said:

"Whatever his purpose he took something belonging to the A.B.C. Co. (contractor) with or without the right to do so, and his obligation under the circumstances is to pay for it."

The higher court held further that since the contractor had breached his contract with the property owner, the latter was relieved from paying anything on the contract price and the contractor must remove from the building all previously installed equipment.

### Material Scarcity No Excuse

According to a recent higher court one who continues to use a defective heating appliance is liable for damages resulting to another, although a new appliance is not available.

For example, in Schon v. James, 28 So. (2d) 531, reported March, 1947, it was shown that a water heater on a second floor leaked and water damaged merchandise stored on the ground floor.

The owner of the spoiled merchandise sued the second floor tenant for damages. The latter had a plumber testify: "I know it is an old make." The plumber stated that it had not been replaced because a new one could not be obtained, saying: "We could not obtain a new one to put in its place."

Nevertheless, the higher court held the second floor tenant liable in damages to the first floor tenant, saying:

"It is obvious to us that the heater was in very bad condition and that there was always grave danger that another leak might develop. . . . The true cause of the loss here was not a latent defect but a worn-out heater. The defendent continued to operate it at his peril."

For comparison, see American Jurisprudence, Vol. 38, page 747, Sec. 87, as follows:

"For example, the owner of a boiler is liable for any defects in the manufacture thereof that might have been discovered by a reasonable inspection and test; but if an explosion results from defects that could not have been discovered by such an investigation, he will not be held responsible. . . ."

### Payment for Home Work

Under all circumstances an employe who expects payment for work on Sundays and evenings at home must positively prove that his employer agreed to pay for extra services. Otherwise he cannot recover a favorable verdict.

For example, in Perlman v. Skolnick Corp., 39 Atl. (2d) 186, the testimony showed facts, as follows: An engineer was employed at an agreed wage of $100 a week, on a forty-eight hour weekly basis, with time and one-half for overtime. He worked for seven months when he was discharged, and was given a check for his last week's pay. The next day he returned the check with a demand for $1,738 for overtime on Sundays and holidays, and evening home work.

The engineer *proved* that he had worked the necessary overtime on Sundays and evenings to earn $1,738, but he *failed to prove* that his employer *agreed* to pay extra for his work at home. Therefore, although the lower court held in favor of the engineer, the higher court reversed the verdict, saying:

". . . Assuming that the plaintiff (engineer) did work Sundays and evenings at home, he cannot recover pay for that service in addition to his regular wages. He does not show that any responsible officer of the corporation (employer) agreed to pay him for it as overtime. . . ."

### Lien Held Valid

Although a property owner does not personally order or contract for labor or materials for installation of a heating system, yet a mechanic's lien is valid if the property owner's husband, wife or other agent approves the installation.

For illustration, in Toy v. Rogers, 165 Pac. (2d) 1017, the testimony showed facts as follows: A woman who owned real property leased it to a tenant under a lease contract which specified that the woman would advance to the tenant $5,000 for remodeling and repairing the building. After the tenant had spent the $5,000 he ordered other services and labor including installation of a heating system. When the woman refused to pay the bill the contractor filed a mechanic's lien.

During the trial the testimony proved that the woman's husband was frequently on the premises; saw the work as it progressed; issued orders, and made suggestions with reference thereto. In view of this testimony the higher court held the mechanic's lien valid and enforceable.

### Completion of Contract

Where a contractor does the work specified in specifications, his contract is fulfilled and he is liable only for defects resulting from improper workmanship. Therefore, a contractor is not required to comply with orders issued by the owner's engineer, if the orders do not conform with the specifications.

For example, in Central Power v. Tobin, Inc., 157 Fed. (2d) 482, reported January, 1947, it was shown that a contractor made a written contract with an owner by the terms of which the contractor agreed to furnish the tools, labor and material necessary to complete installation work.

After the contractor had started upon his work, the engineer for the owner ordered him to perform work not specified in the contract.

Legal controversy arose and the contractor contended (a) that the materials furnished met the contract obligations; (b) and that the owner must pay the full contract price. The higher court held in favor of the contractor.

Also, see Las Vegas Development Co. v. Neighbors, 171 Pac. (2d) 962, reported November, 1946, where

it was shown that a contractor took a contract from a large development company. About five months later the work he had done was condemned by the city engineer.

The development company sued the contractor to recover the money it had paid the latter, plus heavy damages. During the trial the contractor proved that the defective work was due to the negligence of the development company, which furnished the specifications. Therefore, the higher court held in favor of the contractor.

### Market Price

According to a recent higher court a heating contractor is entitled to the market value on the day that copper, copper-base alloy and other products are requisitioned by the United States, state or city.

For illustration, in Lessner Plumbing & Heating Co., Inc., v. United States, 64 Fed. Supp. 931, the United States requisitioned 13,000,000 pounds of products from the Lessner Plumbing and Heating Co. In subsequent litigation the federal court held that the government must pay to Lessner Plumbing and Heating Co. the exact market price of the products the day it was requisitioned. The court said:

"The fair market value to be considered and applied in the instant case is the price established under the Copper Recovery Program."

### Manufacturer Breaches Warranty

Considerable discussion has arisen from time to time over the legal question: Is a manufacturer of heating equipment liable in damages for selling equipment that will not satisfactorily perform services? The answer is yes, if the manufacturer or his agent knew the purchaser's intended uses of the equipment.

For example, in Walston v. Whitley & Co., 39 S. E. (2d) 375, one named Walston purchased from a manufacturer, certain oil burning heating and drying equipment. Before making the purchase contract Walston explained to Whitley and Co., the manufacturer's agent, that he was a grower of tobacco and was unable to procure wood to cure his tobacco, and that he wanted oil burning heaters that would properly cure tobacco.

Walston sued both the manufacturer and its agent, Whitley & Co. to recover damages based on breach of implied warranty of the contract of sale of the oil burning heaters or machines. Walston alleged that because of defective manufacture the heaters failed to cure the tobacco crop properly, and within a reasonable time. Walston further alleged that he purchased the heaters relying on the skill and judgment of the manufacturer with respect to their character, capacity and efficiency. Walston also proved facts, as follows: That the heating equipment would not generate more than about 100F; whereas, about 180F are required for proper and efficient curing of the tobacco; that when forced above 100F, the burners and flues filled with smoke and soot and became stopped up so they had to be cleaned out almost constantly; that due to their inefficiency, the heaters required 13 days to cure tobacco instead of four days and five nights normally required in curing tobacco with sufficient heat properly generated.

In holding the manufacturer liable in damages to Walston for breach of the implied warranty the higher court said:

"The alleged representations and warranty went to the quality and capacity of the machines purchased, and were in effect a representation of their essential character, such as have, with marked uniformity, been regarded as warranties for the breach of which damages are recoverable."

However, the higher court refused to hold the manufacturer's agent, Whitley and Company, liable and said:

"Ordinarily, an agent is not liable in an action by a third party for breach of warranty upon a sales contract in which he has acted fully within his authority or within its apparent scope, and contracted only in that capacity."

For comparison, see North Carolina Co. v. Spears Motor Co., 192 N. C. 377. Here the higher court explained that it is uniformly held that an agent will be held liable on a contract where the principal or manufacturer has not been disclosed to the purchaser. But an agent who contracts on behalf of a *disclosed* manufacturer, and within the scope of his authority, is not personally liable if the manufacturer breaches his contract.

### Ownership of Heating Unit

Under all circumstances a seller of heating equipment retains legal title to it notwithstanding it is stolen, sold or appropriated by one who does *not* actually own it.

For example, in Myers v. Hancock, 39 S. E. (2d) 246, reported November, 1946, it was shown that a heating unit stood on legs on a concrete floor. It could be removed without defacing, destroying or injuring the house by cutting the pipes or unscrewing the joints and closing up the openings with plugs, and disconnecting the electric current.

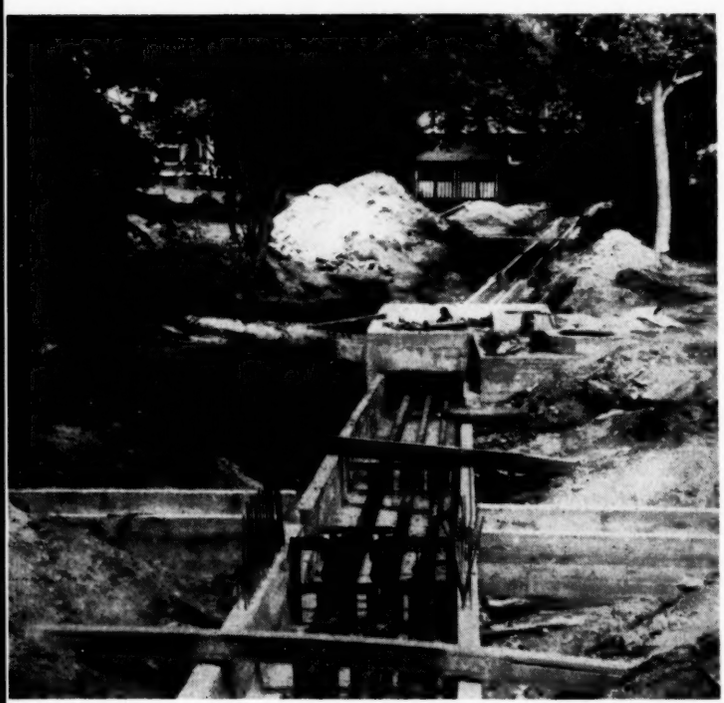
The owner of the house containing the heating unit sold it to a purchaser named Myers. Before the sale contract was signed, the owner of the property made it clear that he would remove the heating unit.

Later the deed was prepared conveying the property to Myers but there was no reservation or mention in the deed of the heating unit.

In subsequent litigation the higher court held that the seller of the property could remove the heating unit, and said:

"At any time before the interest of third parties has intervened, the owner may sever the connection and restore the chattel to its original character of personal property. Severance may be actual, by a detachment of the fixture, or it may be constructive by express or implied agreement to that effect on the part of the owner of the land and his future grantees."

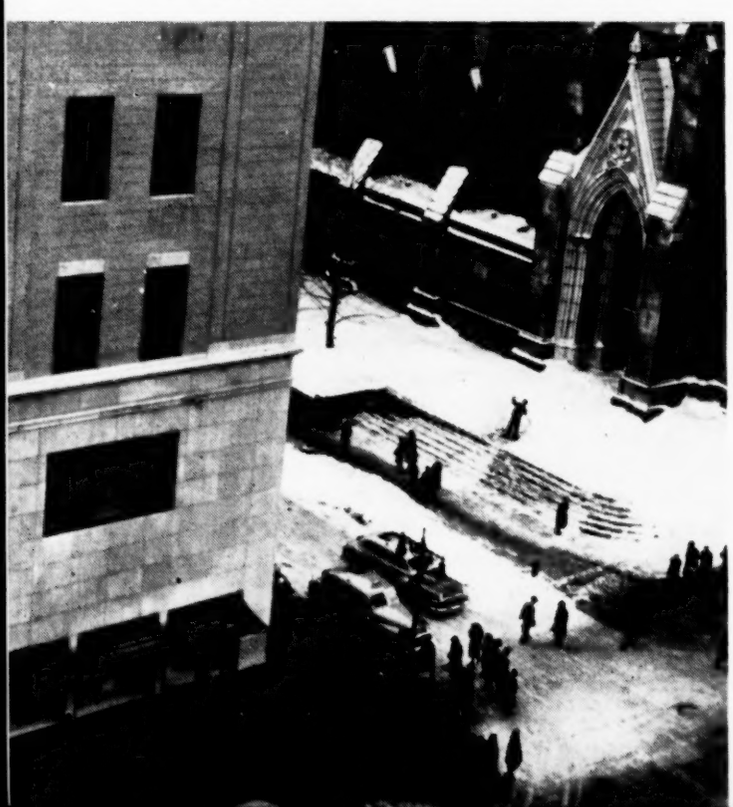
Long life for flexible duct connectors exposed to corrosive fumes and other severe services is said to have been advanced at the Acme Steel Co., Riverdale, Ill., by the use of Fiberglas-backed industrial adhesive tapes. Above left, a double coated tape is applied to both upper and lower flanges of connection between sulphuric acid fume exhaust and stack. Center, a wide strip of rubber-coated Fiberglas fabric is applied. Right, single-coated adhesive tape completes the seal. Tapes are by Bauer and Black, Chicago.

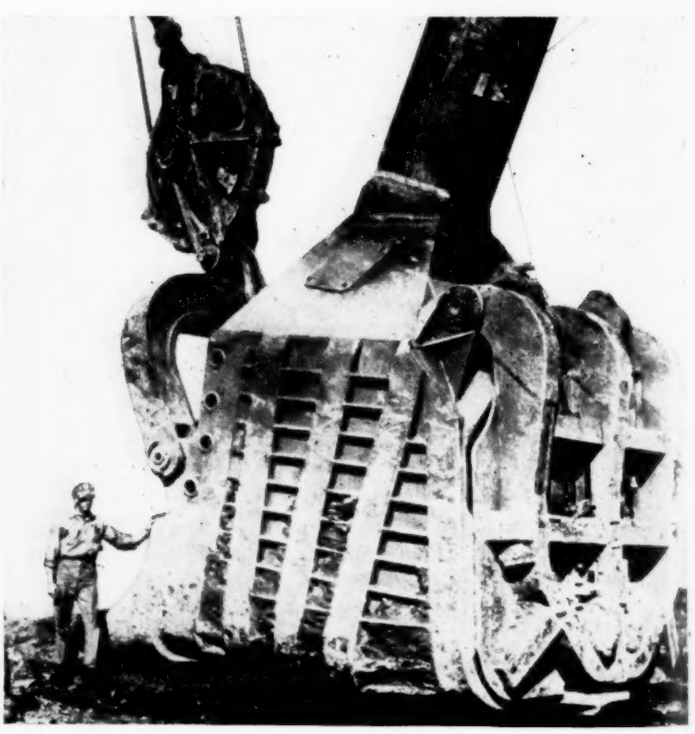


# Picture Paragraphs

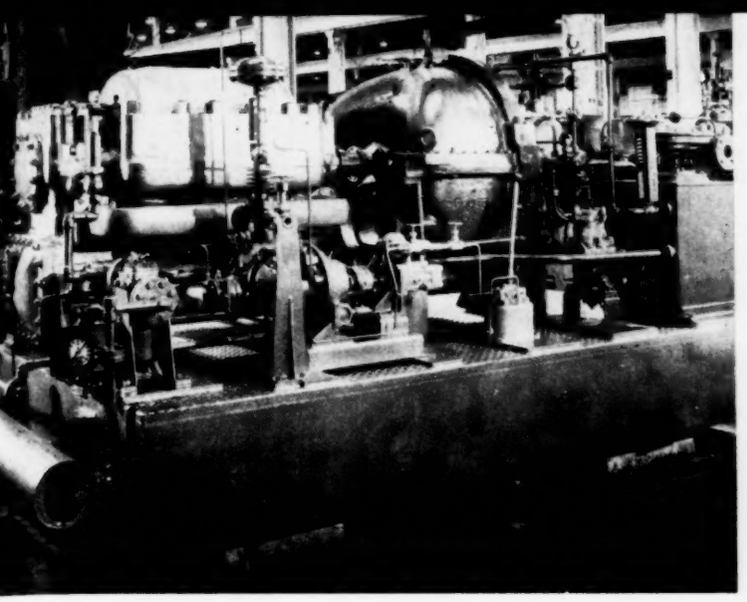
(Left) About 27 tons of wrought iron pipe were used to convert to centralized heating at Smith College, Northhampton, Mass. A concrete tunnel system links buildings, previously heated separately, to a central heating plant on the campus.

(Below) During a record snowfall in New York City, Best & Co.,'s 5th Ave. snow melting system formed an oasis in contrast to snow-bound St. Patrick's Cathedral visible in the background. U. S. Radiator Corp. photo.





(Above) The world's largest shovel dipper, now operated in Cadiz, Ohio, coal fields by the M. A. Hanna Coal Co., has been equipped with rubber bushings by Firestone Industrial Products Co., because steel bearings alone were subject to fatigue failure resulting from constant use of the machine.



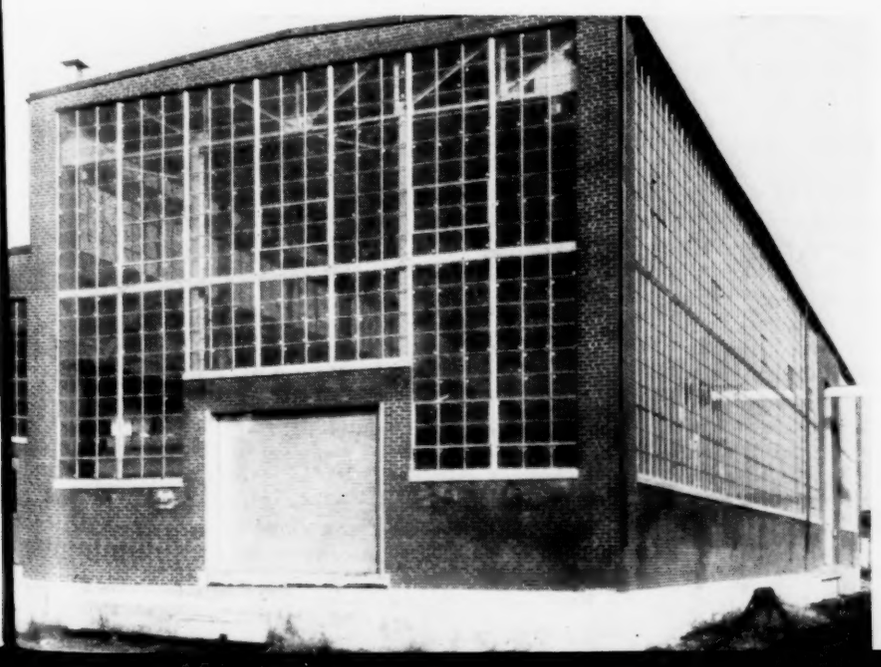
(Above) The first centrifugal compressor for handling propane on shipboard, a 1270-hp unit, has been delivered by Carrier Corp. to the Warren Petroleum Co. It will salvage about 266,000 lb of LP gas per load formerly residual in holds after expansion during unloading.

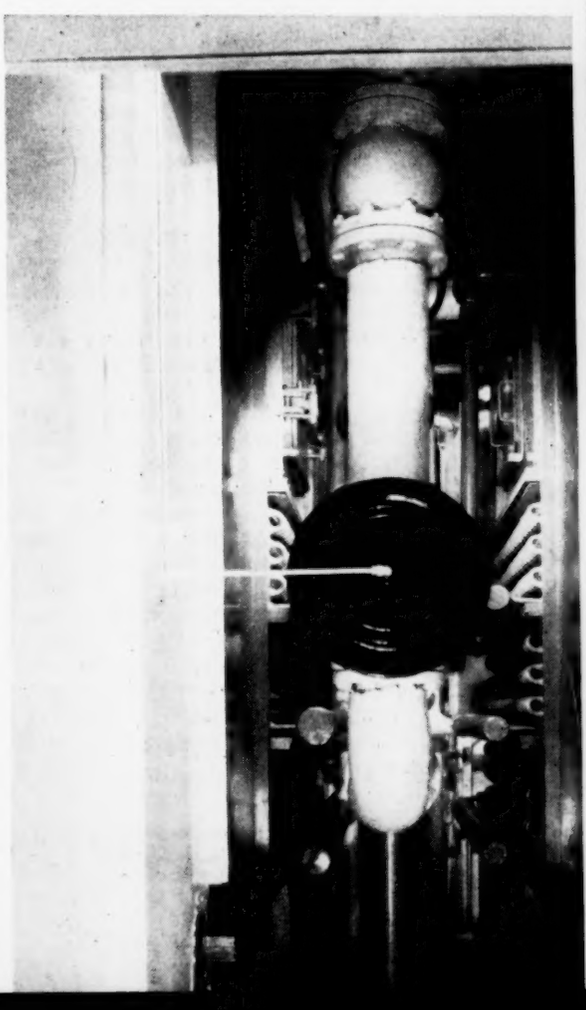
(Above) A heating exhibit at a cattle and horse show excited interest at the National Belgian Horse Show and Dairy Cattle Congress for the Moore Engineering Co. A complete radiant heating system, with wrought iron coils exposed for examination at one end, was built and operated.

(Left) Petroleum Heat and Power Co. has recently placed in service a new "Cessna 195" plane to facilitate frequent contact between the home office at Stamford, Conn., and Petro distributors throughout the country. It is in constant use by personnel in the field.

(Below) Kathabar equipment which removes excess moisture from the air by chemical and refrigeration means has been installed in Shell Oil Co.'s new research laboratory in Houston to maintain 50% R. H. the year 'round. View is of a 17,500 cfm dehumidifier and cooling water control valve. A 12,500 cfm dehumidifier can be seen at right of valve.

(Below) High ceiling and large glass area, common to industrial fabricating plants, posed a heating problem for Penn Iron Works, Reading, Pa. Two Dravo Counterflo heaters, one of which can be partially seen through the window left of the doorway, discharge heated, high-velocity air horizontally at overhead level and pick up return air at low velocity from floor level. The result is so-called "working level recirculation" which is said to keep ceiling losses at a minimum. The two heaters can deliver 2,000,000 Btu per hr.





# Experience is my Classroom

By T. W. REYNOLDS

## ON DOWNING A CUD

One cannot refrain from telling the story of the steamfitter foreman at the Weehawken railroad yards and ferry slips, as fitting into a bit of trouble hunting the writer was doing at this terminal. In those days, George Schmidt of New York would put on overalls if necessary to correct anything that came his way. He could get a pump or any other piece of machinery together after taking it apart. The two of us worked around the ferry slips, trying to make the temperamental vacuum heating system function satisfactorily. We dodged huge rats below the ferry station floor whenever the tide would permit our entrance near the slips.

Ferry boats rammed the ferry slip in winter to free them from ice, thus throwing the underfloor piping system out of pitch. The situation was further complicated by charges and countercharges of two departments (designing and construction), as well as by two former partners, one of whom had sold the vacuum valves, the other had put the system in. In reality, the piping connections below floor were not so bad considering the working conditions.

It so happened that an associate worker, anxious to demonstrate his skill at flashlight photography, had taken a number of views of these connections. These, the writer had with him at a higher up conference into which he was lugged because of his outspoken manner, and to say what his immediate superiors were too diplomatic or afraid to say. The writer did not like the connections and said so at the meeting. A question of veracity arose and matters grew a bit tense. So challenged, the writer recalled the evidence, reached in his pocket for it and indignantly tossed the photographs so as to scatter them over the conference table. Everyone looked them over, then adjourned to the heating system in question to see things for themselves through personal observation.

The writer led them to an opened cover plate in the floor and looked down at the muck below. Then they all looked down. One look and it was apparent that they could not take it. The plumber foreman, however, had already entered and had gone a pace ahead, when suddenly back out he came and rolled about on the floor gasping for breath.

**It was some time before we could get him around to tell what this was all about. We imagined some awful thing had happened down below. We were really more curious than solicitous about his health. It seems that he had accidentally swallowed his tobacco cud and couldn't control such a situation in his close confinement below decks.**

## WHAT CAUSED THE BABY'S DEATH?

**The most interesting, though tragic, law suit with which the writer was ever connected as a witness was the case of a baby asphyxiated by coal gas in a New York apartment house in 1932. The mother escaped death, but was made seriously ill. Obviously, many thousands of dollars were involved in such a law suit.**

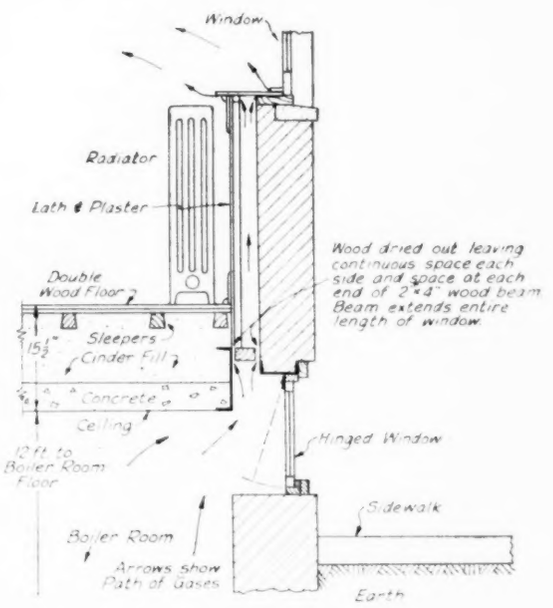
The apartment house was well kept and most modern, built with the floor of the apartment involved directly over the boiler room. The floor was of cinder fill and concrete about 16 in. thick. So the death of the baby through any negligence on the part of the owner (who had retained the writer) was hard to believe. On the other hand, the doctor on the attendant ambulance reported coal gas as present in the baby's lungs, though, at least, it seemed doubtful as to whether he could determine the particular kind of gas.

The writer's first approach to the solution of the problem was a bit of theoretical boondoggling in an effort to prove asphyxiation impossible. Bits of paper were scattered from the roof near the chimney to see if chimney gas would drift to the window of the baby's room. This was on the assumption that the window was open at the time of the accident, as the room was said to have been very hot. The paper was thrown to the winds on a day which had been waited for, a day with approximately the same weather conditions as on the day when the baby died. The bits of paper went everywhere and were collected by an irate janitor.

**Next, the gas range and connecting pipes were gone over for leaks, the floor of the apartment examined for cracks, and any openings for pipes checked. Nothing was wrong, so the janitor was instructed to fire the boiler heavy, to obtain a good fire, then blanket it and check the drafts, the same as he had done for the night's banking not long before the ambulance had arrived. The writer went up to the apartment, was about to give up, then smelled a slight trace of coal gas.**

This led to the idea of heavy dosage of oil of pepperment within the boiler room, an odor often depended upon in plumbing tests for checking any leakage. Again about to give up, the odor began to make itself evident in the apartment. Here was proof enough that coal gas had really been present that night, the next thing was to obtain some visible proof. This, led in turn quite naturally to the use of smoke bombs, so two were set off in the boiler room just below the spot where the baby's bed had been on the floor above, the apartment having been vacated long since.

**We rushed up to the apartment, but there was no smoke. The solution seemed as elusive as it had been to**




How coal gas escapes from boiler room to apartment above.

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

many another trouble shooter on previous visits. Finally, smoke entered at the top of the window sill and drifted to where the head of the bed had been, as illustrated. The shrinkage of wood near the small boiler room window permitted the heated gases to rise and enter the room through clearances made by further shrinkage of wood at the window sill.

The writer's findings were against his own client. The fee for once was better than that of a doctor or lawyer and the owner quickly settled the case out of court.

## COMMON WRONG STATEMENTS

*Statement:* Assuming that a room can be satisfactorily heated with less than the installed radiation, oil will be saved by having less radiators on in that room, also assuming that all other rooms will be neither over or under heated at the same time.

*Correction:* An oil burner has no graduated control. It goes on 100% for the full load and gives a large fire. It will run longer under the conditions stated and the longer it runs the higher its stack temperature will be. Heat will be lost thereby.

*Statement:* Less radiation can be used with automatic heat because it is more responsive and is on less in each hour.

*Correction:* The radiators have to be hot for the same length of time to supply the same amount of heat, whether the system is automatic or manually operated. It is true, however, that less heating may be required with automatic heat due to lower floor to ceiling temperature differentials. This lower differential is brought about by intermittent burner action keeping the average temperature of the radiators higher due to greater effectiveness while on.

## BUNDY LOOP RADIATOR

The old Murray Hill hotel (built in 1884) at 41st St. and Park Ave., New York City, is a good place to eat, good food and service in a quiet old-fashioned atmosphere. The hotel will shortly be torn down to make way for modernity and with it will go some of the few old-fashioned steam radiators which still linger on in the older buildings of New York. What a fine addition a couple of these radiators in various forms would make to a historical museum of the industry.

The radiator referred to is the Bundy loop radiator, the first direct radiator to be made of cast iron. Another form of radiator has preceeded it, the Bundy pipe loop radiator, the first radiator to be manufactured and sold in quantity. These radiators were made by the A. A. Griffing Iron Works, Jersey City, N. J. in 1873.

The Bundy loop radiator consists mostly of short lengths of 1 in. pipe 30 in. long (each one square foot of surface) screwed into a cast iron base. The pipes were in one or more rows and were capped at the top with return bends. The Bundy loop radiator was similar, except that tubes of cast iron were used in place of pipe and their tops were divided to form a loop.

The tops of both types were covered overall by a removable cast iron fretwork top which in time was broken or removed to obtain more heat. The lone Bundy radiator in the vestibule of the basement dining room of the Murray Hill Hotel is unusual for it still retains its top. It is also circular in form. What a friendly place these tops formed in the old days for the warming of frosty gloves and the fingers within the gloves.

They seemed hotter than the radiators of today, probably because of the higher steam pressures used then, and if they couldn't heat from the supply end, they did so from the return end.

Note: Since this item was written, wrecking of the hotel has been almost completed.

## AIR CHANGE IN VENTILATION

Ventilation was of less importance in former days when spaces were less crowded and labor was so cheap that absenteeism was of no great consequence. We then used, and still do to a large extent, the air change method as fixing the amount of air to be exhausted from a space.

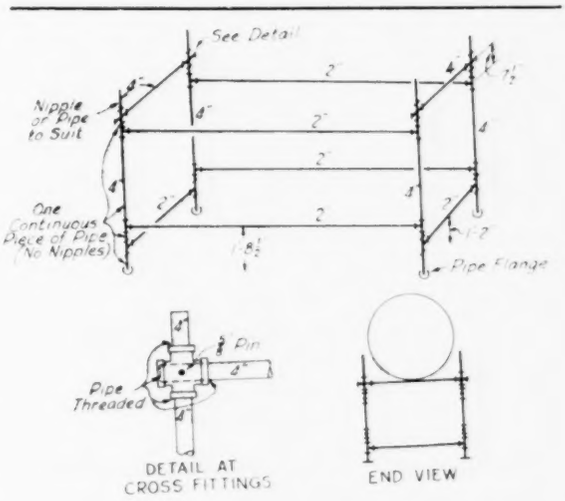
This method is an extremely arbitrary one and quite often carelessly applied without consideration of height or area served, number of occupants within the space, and the heat gains from lights and other sources, together with various other factors which all affect the results obtained.

Of two rooms, identical except for height, the room with greatest height will have a greater air exhaust when ventilated by the same number of air changes. If one room has more occupants than the other room, but is otherwise identical, it is also obvious that the results in the less crowded room will be more satisfactory. The more occupants there are, the more heat and moisture there is to be removed for the same comfort conditions.

Some of the things which should be considered when using the air change method is just what is the temperature of the moving air and where does it come from? Is the air heated or cooled, supplied and/or exhausted pre-used, short circuited from supply to exhaust, or delivered on the back of your neck. Is it drafty near a door through which all of the air may exit, or does it go out one window and come back in the next?

These are all good questions to be fully weighed in each installation, for air may be in motion, but if it is not effectively placed, it is merely lost motion. Some spaces identical in all respects may be equal in quantity of exhaust, or one may even have a greater air quantity, yet the space with the greater amount of air may not have this air as effectively applied and will therefore have less satisfactory results than the space with less exhaust. There is the paradox of more air and less ventilation.

A room which is double the height of some other room should not have twice the amount of air that is exhausted from the one with the lower ceiling. It should however, have, say, 25% more air, for in very high rooms it is much more difficult to insure moving of the air entirely within the occupied height. In reality, the number of air changes for a space should be based upon its greatest possible occupancy, since there is no telling when a space may be converted over to some purpose with an increased number of occupants. In reality, the number of air changes for a space should be based upon its greatest possible occupancy, as it is difficult to tell when the space must take care of additional occupants.




PIPE SUPPORTS FOR HOT WATER TANK

From the writer's data book is reproduced some details on the method of supporting a hot water tank by means of pipes. Cross fittings are threaded at each outlet to receive the pipe and all tees are with slip joints on the run secured by ⅝ in. pins at right angles to the 2 in. outlets. All fittings are extra heavy and all 2 in. pipe is threaded into the fittings.

## WHAT AND WHAT NOT TO INSULATE

As a job develops in its design stage, its a good plan to make notes for specifications as to what should be insulated and what need not be insulated; for example: "feed water heater covered, heater vent not covered."

If the job is a residence you may not want to cover the separate hot water pot stove, for it is small, may only be used at times in the summer and may even burn only refuse or wood from the grounds. Leaving it uncovered also helps to keep the dampness out of the cellar.

You may want to leave the steam pipes in the cellar uncovered for keeping the floor above warm; at least the small runouts need not be covered. These are more expensive in labor to cover. The cellar may still be damp in early fall and need some heat.

**Hot water pipes should be covered, because the heat given off cannot be used to enough advantage to dry out the cellar in the summer, and is not needed in the winter when the cellar is heated by bare steam pipes. In any event, uncovered hot water pipes lead to too much cooling and withdrawal of water. They certainly should be covered if an expensive fuel is used, such as gas.**

If you leave off the covering on the hot water line to the kitchen and/or there is no circulating line back from the kitchen you may be disappointed in the results. The theory of larger usage at the kitchen keeping the line hot is all wrong if the household is not a large one.

Covering on a steam line in an unexcavated space (below a glass enclosed room which was seldom used in the winter months) got damp in time and fell off. It was not replaced because there was supposed to be no steam in this particular line during most of the heating season, due to radiators above being valved off. Inspection disclosed the line as quite hot, simply because there was a quick vent at the end of the pipe run which maintained the circulation of steam in that run whenever the boiler had steam up for the rest of the building. Substituting a plug for the vent stopped all steam circulation within this line.

**Telling a good pipe coverer to insulate a union will bring tears to his eyes. Unions, in theory, are there to be worked upon; in actual practice they seldom are, anyhow, their bulging presence would make known their identity if and when needed. They look better covered and the effective insulating quality of the covering is better maintained. This is especially so when in time the plastic cement that seals the end of adjacent covering loosens up, if it was ever put on in the beginning.**

This brings to mind the missing covering from two ells, one at the bottom and the other at the top of a vertical pipe. The ceiling near the top of the pipe was all streaked with dirt due to heat circulating inside the covering from ell to ceiling. The draft head was good, the efficiency poor. Less heat would have been lost if this particular pipe had been left uncovered.

## SUPPLY AIR TEMPERATURE

There was a time when no engineer would blow conditioned air into a space at a temperature lower than 10 to 15F below that to be held in the space. Some engineers still follow this practice and defend it by saying this gives a quantity of air sufficient to diffuse the air and moisture throughout the conditioned space. Moisture, however, is capable of taking care of itself and will soon diffuse.

Due to the better diffusion qualities of modern ceiling outlets, it is now quite common to design with a conditioned air supply of 60F; in fact some installations are operating with much lower temperatures of the air supply. The writer himself has been guilty of this practice.

**What else can one do where there is a sick air conditioning system that was either under-estimated in the beginning or subsequently overloaded, or where the space for ducts is too limited, except for air duct velocities that are noisy or give too much friction. Of course, there are some jobs that are over-estimated, so that a contemplated 50F air supply might in operation be as high as 60F, except possibly for short peaks of load.**

It is hard to make up one's mind when it comes to the question of introducing supply air at a temperature as low as 50F. Nor does the engineer like to introduce air from a low ceiling, or to do so with an unusual high rate of air change. Suppose there is a combination of all these disadvantages. What then? Nevertheless, each of these things can be demonstrated in the laboratory to be needless worries; in fact, they can even be done in combination, yet with satisfactory results.

There are some limitations, however, as to the temperature condition of the supply air. Its dew point must not be more than 5F lower than the dew point of the conditioned space if condensation is to be avoided on the outlets. Furthermore, control requirements become more exacting where space is subject to substantial variations in the sensible heat load and the supply air temperature is very low.

**Nevertheless, the many savings made possible by lowering the temperature of the supply air are tempting. Savings go all along the line from transportation to handling and to less weight in the structure, while any excessive rate of air movement due to high internal load requirements can be avoided. Savings can be made in first cost of apparatus room, fans, coils, supply outlets, and in the supply ducts and their insulation, as well as in the operation and maintenance of this equipment. If the outdoor air quantity is based on the usual 25% of the total air, then the return ducts and grilles, the outdoor air louvers and the filters can all be smaller and the refrigeration load will be less.**

As ducts are reduced in size their heat gain is lessened and space for the ducts can be more readily obtained. Sometimes there are installations with space limitations so restricted that costs would be greatly increased because of the increased number of circuits and outlets required by supply air at the usual higher temperatures.

## REWARDS OF HARD WORK

The writer cracked his shell in a place and at a time when it was repeatedly said "Work hard and you will get somewhere." Its a bit old-fashioned, this saying, but still holds, for one can lose his job, but not his experiences. An organization may be such that the boss gets no credit for the hard work you do, so you, of course, get none from him, yet there are those about you who realize your capabilities. When they leave for higher things they take you along, or there are others who know about you and pass the good word along.

**It is not so easy to sell yourself to a strange employer, but you cannot keep him from hiring you if Mr. Smith tells him you are the man.**

It is not a hard job not to work hard. One gets plenty of encouragement in this direction. In this connection, the writer recalls the time spent in railroad yards investigating underground piping on appraisal work. To the best of memory it was around Niagara Falls where a yard foreman stopped the writer and said, "Young man, you work so hard for the railroad, but it's a waste of time. You won't be president of this railroad."

Time has proven his prediction as right, but the writer has never worked with the president's job ever before him. It was rather for interest in the work, for no one would have known the difference in the tabulation, what ever had been turned in. What was gained, however, was a knowledge of how things are done in the field.

**Working once for a large manufacturer who had certain subsidiaries, the writer extended his promotion of products to the subsidiaries as well, yet never received any credit for doing so. Sales organizations have a theoretical set-up which does not credit one with work for the company as a whole or for anything beyond the immediate territory. If you work hard in such places, you will work hard, and much will be loaded on you. On the other hand, the more you do, the more you gain in experience which can be converted into cash later on in life.**

# THE SALES ENGINEER

## Selling the Contractor

**BERNARD LESTER**
Sales Engineering Consultant

"IN this field we are always in a price market" remarked one heating and ventilating contractor as a bid on a list of blowers was handed him. He glanced at the total price and shook his head. "I am afraid that won't do it."

It is true that many Sales Engineers regard this market as a "price market." Why is this? The ready answer is, "Well, the contractor gets the contract on a price basis, so he has got to use the lowest bid to get by."

Though the work of the engineering contractor himself involves many elements of sales engineering, let us focus on the Sales Engineer selling his apparatus.

The more exactly a written specification can cover all the factors of purchase, the less sales engineering enters the picture. Cement and lumber can be closely defined in writing. Should prices be the same, the business goes to him who meets the specification, and establishes his integrity and ability to deliver.

Friendship, of course, counts. In short, here is a business transaction requiring not much technical skill.

But no specification can establish all the qualities involved in complicated and specialized heating and air conditioning apparatus. True, there are materials and workmanship, but beyond these are important elements—design and application engineering—all affecting price and performance. These are based on "know how." They represent a large measure of value, and apply not only to the apparatus, its selection and application, but the smooth handling of the installation and responsibility to back up the job for years.

What, then, can the Sales Engineer sell? These:

Apparatus—establishing the results of its quality.

Engineering ability—skill in selection and application for the job.

Ease of installation.

Low maintenance.

Reliable operation.

Reputation of his company—to perform on time and back up work done.

Himself—as a friendly, interested, fair, and capable person.

Price.

And in considering what the Sales Engineer has to sell, don't forget his sales tools. The typed and pictorial word—literature and current advertising.

But how many Sales Engineers do a *complete* job in selling? Not many. Why? Usually, because we don't appreciate and capitalize, in our selling, all the factors involved. Still more often because we choose the easy path. Thinking—forcing the imagination—is hard work. We accept the price concept. Meet the specification, itemize the apparatus, quote price and delivery, and the job is done! If we don't get it, then the responsibility can be passed on to headquarters.

Years ago, I took in to my boss a Lost Business Report from a field salesman covering a sizable lot of electrical apparatus. The job was lost on price. It said so right in the report! "We would have got that order" commented my boss, "if we had had a Charlie Schwab selling it."

Contractors naturally stress price. Doesn't any buyer? But present and eventual "price" can never be stated in a single figure. The most expensive may be the cheapest.

Let's see what interests the responsible contractor. He, too, is in business for keeps. He knows full well there is a lot to it beyond price, for profits melt when the supplier or his product fail to perform. His interests all hang on making a final profit. They may be segregated into:—

Initial cost based on supplier's bid.

Savings after he receives the award. Here's when the pressure may be on the Sales Engineer again.

Savings made in installation and to the point of getting the money.

Benefits in years to come from a reputable accomplishment.

The successful Sales Engineer takes all these factors into consideration and goes far beyond specifications, price, and delivery, in his selling. He lifts himself above the peddler. He not only has a sharper focus but a broader vision. He is selling what is in his head in addition to what is in his "sample case."

Here is his line of action:—

Talk apparatus in terms of *results from operation.*

Give *meaning* to design features.

Demonstrate ability to select and engineer the apparatus assembly for the purpose intended.

Dramatize savings to the contractor not only from apparatus performance, but the supplier's performance in fulfilment of the installation.

Evaluate price beyond that of a figure stated in the bid.

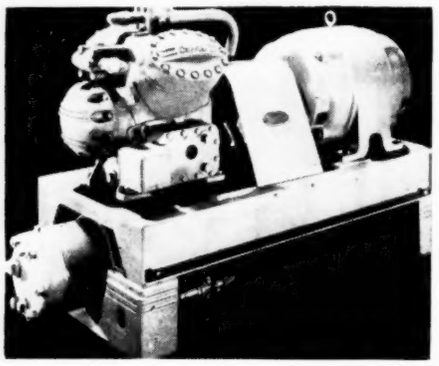
Establish every statement by *actual examples experienced* upon previous installations made for others.

# NEWS OF EQUIPMENT AND MATERIALS

### Reciprocating Compressor

NAME—Carrier reciprocating compressor.

PURPOSE—Compressor for air conditioning and refrigeration equipment.



FEATURES—Makers claim that the new designed unit operates at higher speeds and is about half the size and weight of previous designs. Users can select a coupling for direct drive or a flywheel for V-belt drive. The line is so designed that all components — the compressor, motor, base, coupling, and condenser can be individually selected to meet the specific needs of the work to be done. Unit can then be assembled easily on the job without special tools. Features of the new compressor include automatic load-free starting; built-in automatic load levelers; external control of capacity; vapor-cushioned valves; removable cylinder sleeves; vapor cooled cylinders; removable precision bearings; oil-cooled shaft seal; automatically reversible oil pump; and magnetic oil drain plugs.

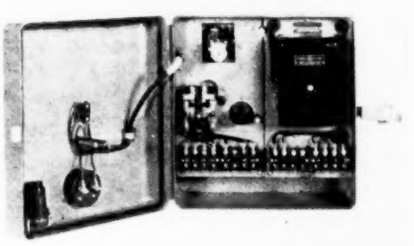
MADE BY—*Carrier Corporation, Syracuse, N. Y.* .....75

### Oil Burner Control

NAME—G-E photoelectric combustion control.

PURPOSE—Combustion control system for commercial oil burners.

FEATURES—Unit consists of a master control unit, a photo-tube unit and an electrode unit. System is designed to shut off the flow of fuel to an oil burner if the oil fails to ignite or if the flame is extinguished after successfully igniting. On gas-electric ignition systems it prevents fuel from flowing if the gas pilot does not ignite. System permits burner motor to operate for a definite period after shut-downs or combustion failure in order to purge the nozzle or cup of unburned fuel thereby preventing carbonization. A light on the cabinet cover indicates when the equipment has gone to lock-out. In case of flame failure after a successful starting a new starting cycle is initiated following a definitely timed purging period. All parts of the system can be removed for servicing or inspection.



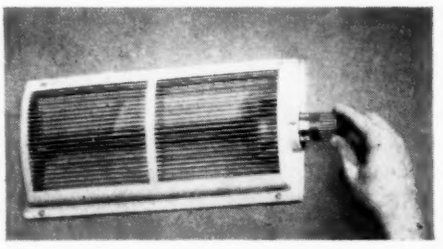
MADE BY — *General Electric Co., Control Division, Schenectady 5, N. Y.* .....76

### Control Register

NAME—Thermo-Matic register.

PURPOSE—Air register designed to control room temperatures by regulating the warm air input from each register in direct relationship to heat loss from each room.

FEATURES—A turn of the thermodial on the right hand side of the register provides automatic control of the heated air from the register to maintain room temperature at a pre-determined setting. Thermostatic element is actuated by air in the room. By means of an aspirator principle, room air is circulated over the thermostatic element at the rate of about 75 fpm. This provides a direct relationship between the element temperature and the room comfort.



LITERATURE AVAILABLE—Bulletin.

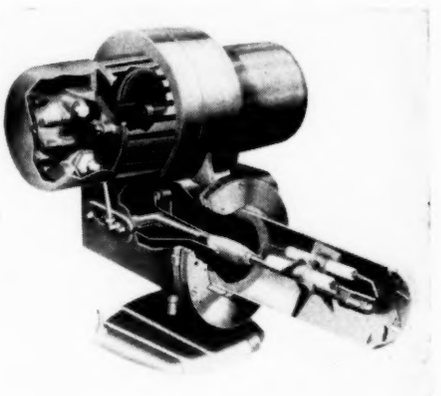
MADE BY—*Dole Valve Co., 1933 Carroll Ave., Chicago 12, Ill.* .....77

### Oil Burner

NAME—York-Shipley Model C-7 oil burner.

PURPOSE—Conversion type burner for small homes.

FEATURES — Unit is the smallest gun-type, pressure atomizing conversion oil burner in this company's line and the construction is such that the motor, pump and fan are mounted above the air tube center line. It has the Iris shutter which is a variable size orifice mounted on the discharge side of the fan to meter the primary air for combustion. The deflectors in the air tube impart a circular motion to the combustion air stream.



Air guide deflectors and nozzle pipe are adjustable—forward or backward.

SIZES AND CAPACITIES—Available in seven different capacities, adaptable to any boiler or furnace in the small home heating field. It will operate on No. 1, 2 or 3 fuel oil. Firing capacity is from 1.0 to 2.25 gal per hr depending on size of nozzle.

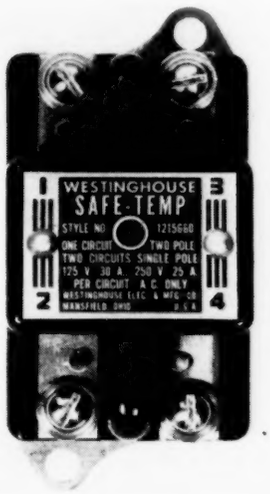
LITERATURE AVAILABLE — Bulletin RD-47-11.

MADE BY—*York-Shipley, Inc., York, Pa.*.....78

### Thermal Protection

NAME—Safe-Temp.

PURPOSE—Automatic thermal protection control for Westinghouse electric heaters produced since 1945.




FEATURES—Heat from the tank wall activates the cut-off mechanism at temperatures varying from 180 to 205F depending upon the type of tank mounting and the wattage of the heating element. Upper temperature limit is set at 205F so that water cannot reach the boiling point even at relatively high altitudes. Once current is shut off, unit keeps the power off until the cause of the excessive temperature is corrected. Control can be easily reset and plac d back in operation.

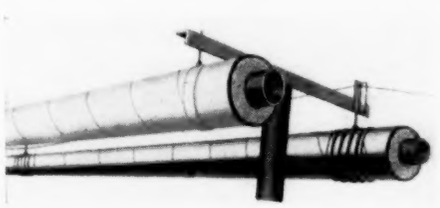
MADE BY—*Westinghouse Electric Corp., Appliance Div., Mansfield, Ohio.* .....79

### Insulated Pipe

NAME—Ric-wiL foilclad pipe.

PURPOSE—For overhead distribution of process liquids and steam.

FEATURES—Asbestos, cork, or other insulation, as specified, is machine coated on the pipe with high temperature asphalt and is tension wrapped with asphalt-saturated asbestos felt. A second coating of asphalt is followed by a tension wrapping of aluminum or copper foil to form a good bond with the asphalt. Result is an insulated, waterproof and weather protected pipe. Variation of this design uses a pipe support within a pipe with insulation around the outer pipe so that any desired temperature can be maintained within the pipes. Units are shipped in 21-ft sections completely prefabricated and ready for installation.



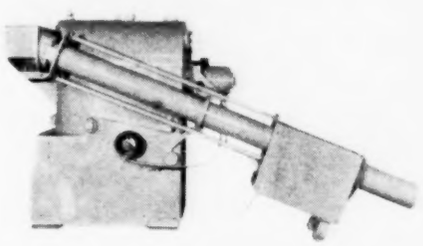
MADE BY—*The Ric-wiL Co., Dept. 182B, Cleveland, Ohio.* .....80

### Boiler

NAME—Anthratube.

PURPOSE—Automatic burning of coal based on a new principle developed by the Anthracite Institute.

FEATURES—Anthracite is burned in a tubular firebox of small cross sectional area. A small quantity of coal is fed steadily as required and is burned at a high rate of combustion thereby producing much more heat absorption than by conventional methods. Coal is fed automatically through the revolving tube, a few ounces at a time. When boiler water has reached the required temperature, the aquastat stops the induced draft fan and the fire is immediately banked. When ash should be removed, the grate is automatically set in motion ejecting the completely burned ash into an enclosed ash container. Fly ash that might be present is drawn back into the fly ash eliminator and then into the ash container. Hot gases are drawn off the fire bed in a rotary, swirling motion, enabling heat from the exhaust gases to be transferred to the water surrounding the hot gas chamber. Unit burns pea size anthracite.



SIZES AND CAPACITIES—Unit occupies a space 4 ft by 2¾ ft with a height of 3½ ft. Output 115,000 Btu hourly.

LITERATURE AVAILABLE—Illustrated folder.

MADE BY—*The Kenwill Corp., Cleveland 13, Ohio.* .....81

### Welding Torch

NAME—Airco 800.

PURPOSE—Torch design for oxy-acetylene welding.

FEATURES—Unit has a capacity for operating single flame welding tips from No. 0 to 13, inclusive, and multiflame tips up to No. 15. This makes unit suitable for almost any welding job from the thinnest sheet metal up to more than 1½ in. thick. Torch head is made of Monel metal.

MADE BY—*Air Reduction Sales Co., 60 E. 42nd Street., New York 17, N. Y.* .....82

### Portable Fan

NAME—Lau P-18 portable fan.

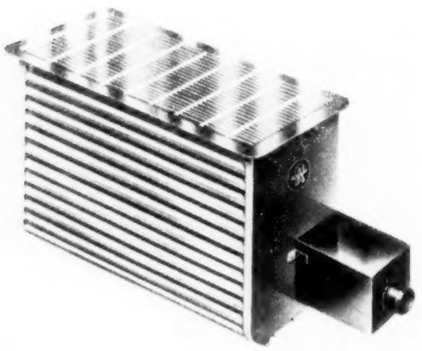
PURPOSE—For general room ventilation.

FEATURES—Unit which can be placed on a table, in a window, or a transom, measures 22-5/16 in. square and 7-11/16 in. deep, and delivers 1800 cfm. It can be reversed so that air movement can be in either direction.

MADE BY—*The Lau Blower Co., Dayton 7, Ohio.* .....83

### Floor Furnace

NAME—Rheem gas-fired floor furnace, 1600 series.
PURPOSE—For space heating.
FEATURES—Unit is available as a flat register, standard dual wall or



space saver wall model. Manufacturer claims that heating efficiency is provided by supplying each gas port with the maximum air intake area. Unit burns natural, manufactured, mixed, or liquid petroleum. A down draft diverter prevents sudden flue drafts from extinguishing the burner and also permits the continuance of normal up-drafts. Baffles inside heating elements slow the escape of hot gases until the major part of the usable heat is exhausted. Corrugations of the galvanized casing absorb contraction and expansion.
MADE BY—*Rheem Manufacturing Co., 570 Lexington Ave., New York, N. Y.* .....**84**

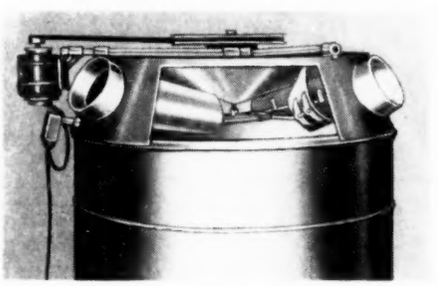
### Stroboflow

NAME—Stroboflow.
PURPOSE—For reproducing desired rates of flow in liquids.
FEATURES—Unit consists of a pre-

cision made turbine mounted on stainless steel pivots in graphite or bearings between transparent panes and allowed to rotate so that it floats in synchronism with the liquid. The rotational speed of the turbine is used as a measure of the quantity of liquid flowing. The speed of the rotor is determined from the stroboscopic effect of light viewed through an aperture in the turbine disc. The number of images so obtained is a measure of the rotational speed and, in turn, is directly proportional to the rate of flow. Makers claim that the accurate reflection of rotor speed in terms of stroboscopic images makes it possible to maintain a desired rate of flow for long periods of time without fatigue to the operator. The unit has only one moving part and it is self-cleaning. The electronic components are standard items. Each instrument is supplied with five standard jets to provide 40 different rates of flow. Unit is designed to be energized from a 117-volt single phase 60-cycle source.
MADE BY—*K & K Engineering Co., Bolton, N. Y.* .....**85**

### Air Circulator

NAME—Circulataire.
PURPOSE—Forced air unit for



warm air furnaces where it is necessary to correct the problem of homes having one or more rooms that are difficult to heat.
FEATURES—Fan is placed in the bonnet of the furnace and is set in motion when the temperature reaches a pre-determined point and it stops when the temperature in the bonnet drops below the setting. Warm air is forced through all the ducts and individual room temperatures can be regulated by adjusting the duct dampers or room registers. All parts of the fan can be inserted and assembled to one of the duct openings in the bonnet. Makers claim that no new ductwork is necessary and no changes are required from the old system. Motor is secured to a bracket which is adjustable on one of the sections of pipe extending out from the bonnet.
MADE BY—*Corlett-Turner Co., 1001 S. Kostner, Chicago 24, Ill.* .....**86**

### Incinerator

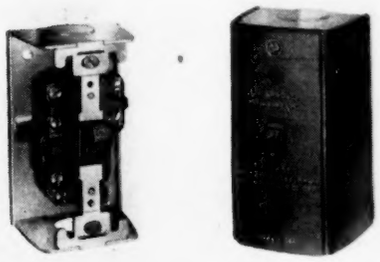
NAME—Gar-Disposal.
PURPOSE—Disposing of garbage

and rubbish through a building installed incinerator.
FEATURES—Air is directed down through the organic substance thereby withdrawing moisture from the refuse. Warm air from the pilot also circulates through the refuse to assist in this dehydrating process. As the moisture becomes dry and combustible it is ignited by the pilot and fully burned. Makers claim that incinerator operation is odorless and simple.
SIZES AND CAPACITIES—Height, 32-¼ in. by 20 in. deep by 20 in. in length. Capacity, 1.5 bushel.
MADE BY—*The Electrocap Mold Co., 115 E. Carson St., Pittsburgh 19, Pa.* .....**87**

### Starting Switch

NAME — Allen-Bradley Switch for starting.

PURPOSE—For starting motors of 1 hp or less in size.



FEATURES — Snap switch has a molded plastic cover and an overload device which operates on the soldered ratchet principle. It is impossible to hold the switch closed under sustained overload but it can be reset easily with the regular switch lever after the overload is cleared. Unit can be supplied without enclosure for mounting in a standard switch box or machine base.

MADE BY—*Allen-Bradley Co., Milwaukee, Wis.* .....88

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### Capacity Control

NAME—Brunner suction valve unloader.

PURPOSE—To control the suction pressure of compressor units.

FEATURES—Unit is able to meet air conditioning problems to a closer tolerance. Unloader control valve governs the operation of the unloader piston. When the correct combination of suction gas pressure below the diaphragm and spring pressure above the diaphragm is obtained, the valve opens and admits discharge pressure to the top of the unloader piston. Valve can be made to open at any suction pressure by setting an adjustment screw. Unit is illustrated installed on a 10 hp unit.

MADE BY — *Brunner Mfg. Co., Utica 1, N. Y.* .....89

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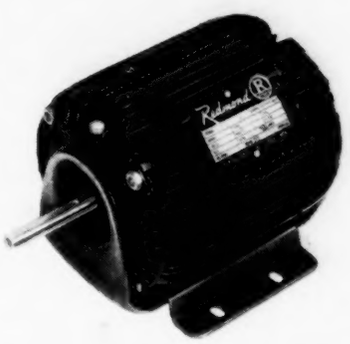
### Motor

NAME—Redmond type Y micromotor.

PURPOSE — Fractional horsepower motor designed for exhaust fans, floor heaters, air circulators, and unit heaters.

FEATURES—This 6-pole shaded pole




fractional horsepower motor operates at 1000 rpm. Unit has die cast case and finned surfaces for maximum cooling. Rotors have completely filled slots to avoid collection of dust and dirt. All laminations are pneumatically stacked and field coils are machine wound and varnish baked. Rubber cushions insulate motor from base.

SIZES AND CAPACITIES—Ventilated models up to 1/15 hp and totally enclosed models up to 1/20 hp.

MADE BY — *Redmond Co., Inc., Owosso, Mich.* .....90

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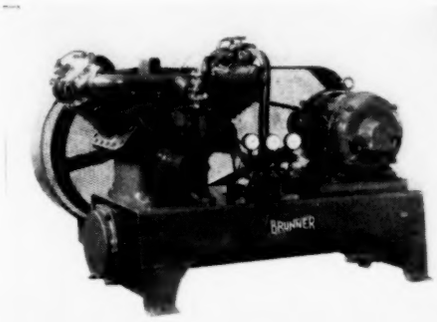
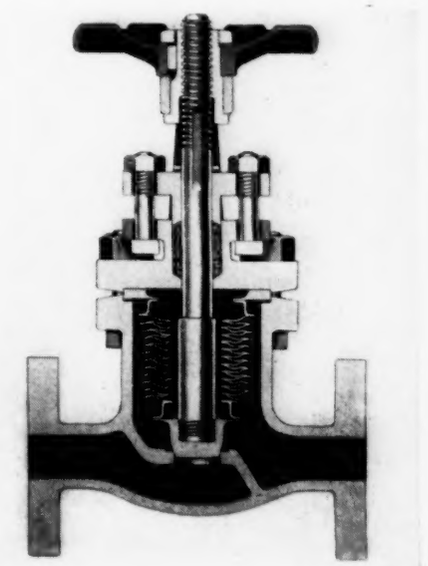



### Bellows Sealed Valve

NAME—Powell bellows sealed valve.

PURPOSE—Valve designed for high vacuum service and for use where packing failures have been experienced.

FEATURES—Bellows is entirely enclosed within the valve body. A gasketed, brazed or welded joint can be provided at the body neck flange to make a pressure or vacuum tight seal. Unit is equipped with a gland packed stuffing box. Stresses encountered in raising and lowering the disc are transferred to the wide



flat portion of the bellows flanges. Made of various metals and in globe and Y-valve types.

MADE BY—The Wm. Powell Co., *2503 Spring Grove Ave., Cincinnati 22, Ohio.* .....91

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### Air Diffuser

NAME—Agitair type RTC.

PURPOSE—Air diffuser designed for installation in ceilings using acoustical sound absorption materials.

FEATURES—Unit is made to conform to standard tile dimensions to avoid the need for trimming tiles to accommodate diffusers. Unit is square or rectangular in shape and blends in with the pattern formed with the tile.

MADE BY—*Air Devices, Inc., 17 E. 42nd St., New York, N. Y.* .....92

### Air Conditioner

NAME—Frigidaire air conditioner.
PURPOSE—Packaged unit designed for use in stores or restaurants.
FEATURES—Unit occupies only 7.5

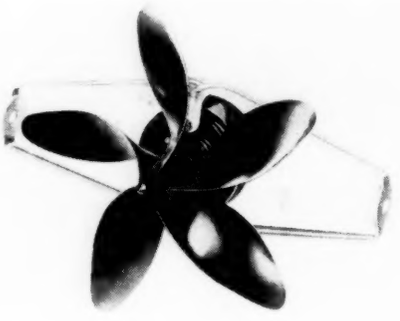
sq ft of floor space with a refrigerating unit, motors, cooling coils and fans housed in a single steel cabinet. Conditioner can be used from a remote position by employing a duct system. For winter operation, a heating coil can be added. Electrical, water and drain connections are grouped closely for ease in assembly. Four removable air outlets with air flow deflector blades circulate the conditioned air from the removable hood at the top of the cabinet. Fan and motor are mounted on rubber in a sound-insulated chamber beneath the hood. Refrigerating unit has a two-cylinder compressor mounted on twin water-cooled condensers connected in parallel. Unit is powered by a 5-hp, 3-phase, 220-volt motor.
MADE BY — *Frigidaire Division, General Motors Corp., Dayton 1, Ohio.* .....**93**

### Pipe Insulation

NAME—Foamglas pipe insulation.
PURPOSE—Pipe insulation that can be used for both hot and cold lines and both indoors and outdoors.
FEATURES—Makers claim that this composition is not affected by humidity and is highly resistant to fumes, vapors, and acid atmospheres. It is also resistant to fire. Insulation comes in two equal half-sections, 18 in. long, and is manufactured for all sizes of pipe. When installed, insulation may be used through temperature ranges from —200 to + 800F. Product is composed of the same material and has the same characteristics as the Foamglas blocks and slabs used for roof, wall and floor insulation. Foamglas, it is claimed, has the same thermal characteristics whether wet or dry and that it will maintain its original low rate of heat transfer regardless of exposure.
MADE BY — *Pittsburgh Corning Corp., Pittsburgh, Pa.* .....**94**

### Air Circulator

NAME — Roto-Beam air circulator model A. V. 112.
PURPOSE—Air circulation.
FEATURES — Propeller blade is



molded in one piece of bakelite and is said to be statistically and dynamically balanced. Surface of the five blades is utilized from center to tip to impel the air in two beams moving at different speeds. Differential pressure between these beams causes a pulsating movement. Unit comes with standard 110-volt a-c motor. Also available for d-c current and other voltages.
MADE BY — *Roto-Beam, 1744 N. Keeler Ave., Chicago 39, Ill.* .....**95**

### Slide Rule

NAME — Tube Turn velocity and pressure drop calculator.
PURPOSE—To facilitate solution of fluid flow problems.
FEATURES—Rule provides a quick estimate based on the pipe friction factor of 0.006 and an accurate solution derived from the estimate by applying a correction factor to the straight pipe losses. Fitting and valve losses are independent of the friction factor and, therefore, are considered not to require correction. One part of rule is devoted to liquids and another to gaseous fluids. The correction chart, and the slide giving fitting and valve losses, are common to both types of fluids. Slide rule will not give accurate solutions for gaseous fluids where the pressure drop exceeds 10 to 15% of the initial pressure.
MADE BY—*Tube Turns, Inc., 224 East Broadway, Louisville 1, Kentucky.* .....**96**

### Welding Torch

NAME—Lincoln electric carbon arc torch.
PURPOSE—Designed to extend the use of welding equipment to work where the application of heat is desired without melting the metal being worked on.
FEATURES—High temp rature flame is produced between two copper coated carbon electrodes clamped in aluminum alloy jaws. Both carbons are readily adjustable and are geared to move together so that the angle of the carbons is kept constant at all times. A slight move-

ment of the thumb control adjusts the distance between carbons. Holder jaws are designed for a 5/16 in. or 3/8 in. diameter carbon. The handle is made of thermal plastic.
MADE BY — *The Lincoln Electric Co., Cleveland 1, Ohio.* .....**97**

### Feed-Water Control

NAME—Micro-Netic electric boiler feed-water control.

PURPOSE—To control feed-water for boilers.

FEATURES — A ball float of Monel metal carries a steel ring which attracts the magnets when the ring comes into their fields. A Microswitch is used. When the level of the water in the boiler lowers to a pre-determined point, the magnetic action opens the water line and when the level reaches a determined point the feed line closes automatically.

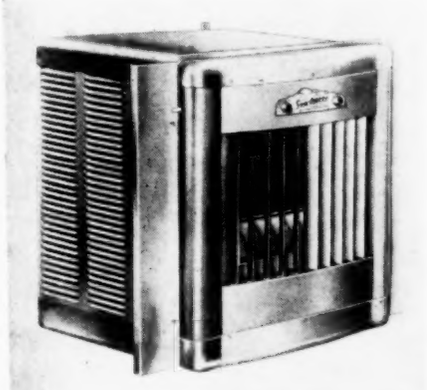
MADE BY—*J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif.* .....**98**

### Air Cooler

NAME—Sno-Breze evaporative air cooler.

PURPOSE—Window-type air cooler unit designed for small homes and apartments.

FEATURES—Cooler is balanced to the window sill and metal side panels are adjustable to fill in any space between the cooler and window. Cabinet is made of 22-gage rust resistant metal and has a removable rear louvered panel for quick changing of the moisture pads or for servicing. A trough type water distributing system has an automatic water regulator. A copper tubing water connection, a hose drain and a plug-in receptacle are all that are required for the complete installation. Unit is powered by a 1/6 hp motor which has the capacity of cooling and filtering 1800 cfm.



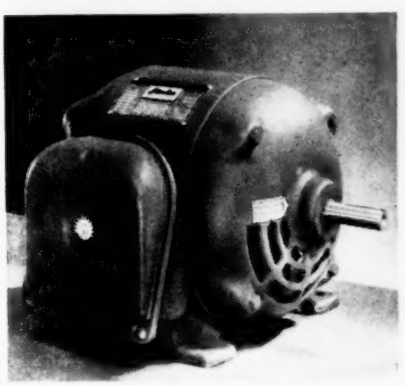
SIZES AND CAPACITIES — 23½ in. wide by 26 in. high by 23 in. deep.

MADE BY — *The Palmer Manufacturing Corp., Phoenix, Ariz.* .....**99**

### Squirrel Cage Motor

NAME—Westinghouse single-phase, life-line motor.

PURPOSE — For any single phase motor application including driving



power for compressors, refrigeration and air conditioning equipment, and pumps.

FEATURES — Capacitor is utilized for starting, and the starting switch or relay disconnects the capacitor as the motor approaches full speed. After that the unit operates as an induction run motor. Air openings are in the lower half of the end brackets to provide protection against dripping liquids. Self-sealed, prelubricated ball bearings are said to provide effective lubrication for five years or longer without repacking.

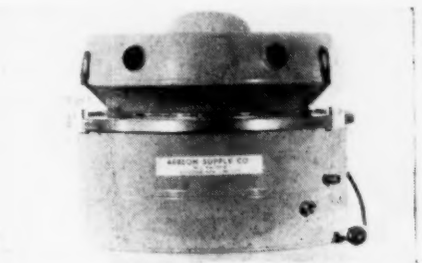
SIZES AND CAPACITIES—Motors are available for 60, 50 and 25 cycle, single-phase, 110 to 220 volts; 110 or 220 volts single voltage, and for 60 cycles, from 1160 to 3450 rpm; for 50 cycles, from 970 to 2875 rpm; and 1450 rpm for 25 cycles.

MADE BY—*Westinghouse Electric Corp., Pittsburgh 30, Pa.* .....**100**

### Humidifier

NAME—Walton industrial humidifier.

PURPOSE—For adding humidity to atmosphere.



FEATURES—Air is brought in from the bottom through a fiberglas filter. Unit has a vaporization capacity of over one gallon per hour. Unit is operated by ball bearing motors, which draw less than 100 watts per unit, and is made of heavy gage copper or other non-ferrous metal. Automatic controls for close regulation of percentages of relative humidity are supplied.

MADE BY — *Abbeon Supply Co., Woodside, New York.* .....**101**

### Unit Heater

NAME—Suspended unit heater.

PURPOSE—Space heating by forced air.

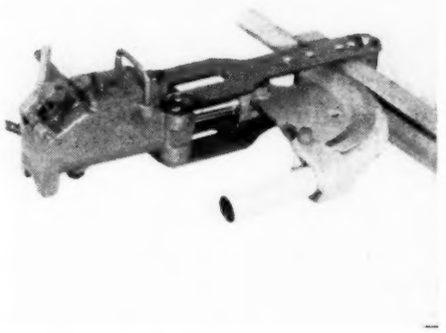
FEATURES—Slow speed heavy duty fan forces air over pressed steel heat transfer sections. Burners are stainless steel. Fifteen adjustable air louvers fan heat over a wide area. Combustion products are fully vented. Standard equipment includes solenoid valve, automatic pilot, limit control, pilot valve, manual shut off valve, low pressure gas regulator. Burns natural, manufactured or liquefied petroleum gas.

MADE BY — *Palmer Manufacturing Co., 2200 W. Fillmore St., Phoenix, Ariz.* .....**102**

### Pump

NAME—Jacuzzi boiler feed pump.
PURPOSE—Pump designed especially for pumping hot water and for other installations requiring high pressure.
FEATURES—Multi-stage centrifugal pump was designed to provide a vertical unit to reduce the floor space customarily required by a boiler feed pump. A lantern ring protects the pump packing against high pressures and is said to prolong packing gland life. Leakage below this ring may be returned to a low pressure stage through copper tubing connection and be recirculated.
SIZES AND CAPACITIES—From ½ to 20 hp.
LITERATURE AVAILABLE — Bulletin No. JBF-1.
MADE BY—*Jacuzzi Bros. Inc., Richmond, Calif.* .....**103**

### Pipe Bender



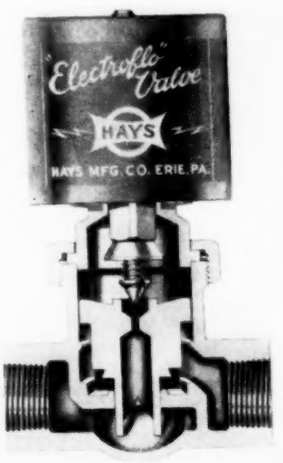
NAME—Greenlee pipe bender.
PURPOSE—For bending pipe or copper tubing.
FEATURES—Unit can be operated by hand, or, if desired, a power pump can be attached to it. Unit will bend pipe in sizes of 2-½ in. O. D. and smaller. Makers claim it can make a 90° bend in less than a minute.
MADE BY—*Greenlee Tool Co., Rockford, Ill.* .....**104**

### Float Switch

NAME—Magnetic proximity float switch.
PURPOSE—Float switch for liquid level control.
FEATURES—Switch part of the unit employs a single-pole, double-throw action which has no direct mechanical linkage with the float part of the mechanism. It is separated by a heavy non-magnetic, stainless steel plate which, in closed tank installations, serves as a pressure barrier or seal between the internal and external parts of the unit. It has a means for varying the leverage exerted by the weight of the float. Units now available are for mounting directly in the side or end of open or closed vessels with internal pressures up to 600 lb per sq in. and temperatures up to 700F. All exposed parts are of non-corrosive materials.
MADE BY—*Magneswitch, Inc., 4281 So. Western Boulevard, Chicago 9, Ill.* .....**105**

### Valve

NAME—Electroflo valve.
PURPOSE — Valve operated through solenoid control.
FEATURES—Valve will operate on water, oil, steam, or air flow. Is said to be quick-acting and will avoid hammer as a result of too rapid closing. The electric current is applied to the solenoid which creates a magnetic field that attracts and lifts a needle from the piston drain orifice. This then permits full flow through the valve.
MADE BY — *Hays Manufacturing Co., Erie, Pa.* .....**106**




MARCH, 1948

## TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 |
| 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 |
| 102 | 103 | 104 | 105 | 106 | | | | |

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# Abstracts AND Reviews

*Publications abstracted in this department should be ordered direct from publisher.*

## HYDRAULICS

Originally designed as a text for those taking beginning courses in the subject of hydraulics, and also for those who are interested in acquiring the fundamentals of this subject, Hydraulics has attained sufficient approval to merit a fifth edition, an unusual compliment for a book first published in 1922. The authors are the late Horace W. King, Professor Emeritus of Hydraulic Engineering, University of Michigan; Chester O. Wisler, Professor of Hydraulic Engineering, University of Michigan; and James G. Woodburn, Professor of Hydraulic Engineering, University of Wisconsin.

In the fifth edition, the authors have made revisions to improve the clarity of the text and to add problems better to illustrate applications of basic theory. The text has also been expanded to include new developments in theory and practice.

Some 500 problems are included to bring out a clearer understanding of principles and information in the various chapters.

The text is divided into 10 chapters as follows: Fundamental principles of fluids; principles of hydrostatic pressure; hydrostatic pressure on surfaces; relative equilibrium of liquids; fundamentals of fluid flow; orifices, tubes and weirs; pipes, open channels, hydrodynamics; hydraulic similitude and dimensional analysis.

*Hydraulics by Horace W. King, Chester O. Wisler and James G. Woodburn. Cloth bound, 5½ x 8½ in., 351 pages. Price, $4. Published by John Wiley & Sons, Inc., 440 4th Ave., New York 16, N. Y.*

• • •

INDUSTRIAL AIR SAMPLING AND ANALYSIS—Number 1 of a series of bulletins on chemistry and toxicology is a 72-page booklet on Industrial Air Sampling and Analysis by Dr. Leslie Silverman, Assistant Professor of Industrial Hygiene, Harvard School of Public Health. It covers routine sampling and control of atmospheric contaminants in maintaining a better place to work. Several methods and techniques for analyzing contaminated atmospheres are described such as test paper and flame test methods, physical methods followed by analytical procedures in current use, dust determinations, mixtures of contaminants in air, flow measurements, the calibration of sampling instruments, calculations in industrial air analyses, routine sampling and recording of atmospheric impurities. A set of tables on the physical methods employed in air analysis, lists the method, principle of operation, type of sampling, sensitivity, the way in which the test is applied to industrial hygiene, and the commercial success of the apparatus. Price, $1.50. Industrial Hygiene Foundation, 4400 Fifth Ave., Pittsburgh 13, Pa.

GAS PILOT BURNER DESIGN—The effects of variations in size and position of primary air openings, burner tube diameter, shields and other protective devices on properties of blue flame pilot burners for resisting stoppage due to dust and lint suspended in the atmosphere are discussed in Research Bulletin No. 46 of the American Gas Association. Results reported are based on studies made with natural gas in experimental test chambers. This bulletin is the thirteenth in a series dealing with gas burner design. For copies of this 28-page bulletin write to the American Gas Association Testing Laboratories, 1032 E. 62nd St., Cleveland 14, Ohio.

HEAT PUMP DEVELOPMENT—Estel B. Penrod, Professor and Head of the Department of Mechanical Engineering, University of Kentucky, is the author of Bulletin No. 4 on the Development of the Heat Pump. This 78-page booklet describes commercial heat pump installations both in America and in Europe, covers heat pumps using water as the heat source and units using air as the heat source, heating costs, and load factor. The bulletin includes an extensive bibliography of magazine articles and books dealing with the subject. For copies write The Engineering Experiment Station, College of Engineering, University of Kentucky, Lexington 29, Ky.

BURNING OILS—Answers to questions about burning oils are presented in a booklet prepared for the public by the Oil-Heat Institute of America. The booklet attempts to answer 29 questions commonly asked regarding the fuel oil picture such as demand, production, synthetic fuels, and the oil shortage. Oil-Heat Institute of America, Inc., 6 East 39th St., New York, N. Y.

ATTIC FANS—A 24-page booklet on attic fans prepared by B. M. Aldrich, Associate Professor of Mechanical Engineering, and J. R. Norton, Assistant Professor of Engineering Research, Oklahoma Agricultural and Mechanical College. For a free copy of Bulletin No. 60, write to the Engineering Experiment Station, Oklahoma A & M College, Stillwater, Okla.

# NEWS OF THE MONTH

## EQUIPMENT BUSINESS VOLUME

### in air conditioning and commercial refrigeration dips to $43.9 million in third quarter of 1947.

Shipments of complete air conditioning equipment and components and accessories for air conditioning and commercial refrigeration equipment were valued at $43.9 million during the third quarter of 1947, according to the Bureau of the Census, Department of Commerce. The third quarter 1947 shipments represent a decrease of 11% from the postwar quarterly peak of $49.5 million shipped during the second quarter of that year.

Shipments of most major classes of components and accessories and complete air conditioning equipment decreased from the preceding quarter. Two major classes showed increases during this period: centrifugal refrigeration machines, 34%, from $1.6 million to $2.1 million; and ice-making machines, 21%, from $0.5 million to $0.6 million.

• **SCOPE.**—This release, *Facts for Industry Series M52A-3-7*, is based on the activity of 71 manufactur-

**Table 1 — Air Conditioning Equipment and Components and Accessories for Air Conditioning and Commercial Refrigeration Equipment:**

**Summary of Shipments by Major Class of Product, Second and Third Quarters 1947**

| Product | Third Quarter 1947 Shipments of Complete Units | | | | | | Second Quarter 1947* Shipments of Complete Units | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | | Domestic[1] | | Export[2] | | Total | | Domestic[1] | | Export[2] | |
| | Number | Value (dollars) | Number | Value (dollars) | Number | Value (dollars) | Number | Value (dollars) | Number | Value (dollars) | Number | Value (dollars) |
| SECTION I—COMPONENTS AND ACCESSORIES | | | | | | | | | | | | |
| TOTAL | | 43,944,234 | | 39,666,945 | | 4,277,289 | | 49,521,308 | | 45,652,730 | | 3,868,578 |
| Condensing units | 293,238 | 20,994,951 | 275,229 | 19,033,272 | 18,009 | 1,961,679 | 319,542 | 23,697,656 | 302,451 | 21,702,375 | 17,091 | 1,995,281 |
| Ammonia refrigerants | 419 | 560,316 | 370 | 510,477 | 49 | 49,839 | 438 | 533,470 | 395 | 488,132 | 43 | 45,338 |
| Refrigerants except ammonia | 292,819 | 20,434,635 | 274,859 | 18,522,795 | 17,960 | 1,911,840 | 319,104 | 23,164,186 | 302,056 | 21,214,243 | 17,048 | 1,949,943 |
| Air cooled | 283,972 | 16,808,899 | 266,572 | 15,210,838 | 17,400 | 1,598,061 | 308,017 | 18,897,124 | 292,060 | 17,362,437 | 15,957 | 1,534,687 |
| Open type | 117,940 | 10,456,526 | 102,391 | 8,944,141 | 15,549 | 1,512,385 | 140,534 | 12,257,495 | 126,585 | 10,867,251 | 13,949 | 1,390,244 |
| Hermetic type | 166,032 | 6,352,373 | 164,181 | 6,266,697 | 1,851 | 85,676 | 167,483 | 6,639,629 | 165,475 | 6,495,186 | 2,008 | 144,443 |
| Water cooled | 8,847 | 3,625,736 | 8,287 | 3,311,957 | 560 | 313,779 | 11,087 | 4,267,062 | 9,996 | 3,851,806 | 1,091 | 415,256 |
| Compressors and compressor units | 159,242 | 8,916,371 | 151,001 | 7,946,163 | 8,241 | 970,208 | 181,624 | 10,124,653 | 172,181 | 9,190,434 | 9,443 | 934,219 |
| Ammonia refrigerants | 970 | 2,260,309 | 762 | 1,803,208 | 208 | 457,101 | 1,118 | 2,152,382 | 935 | 1,670,631 | 183 | 481,751 |
| Refrigerants except ammonia | 158,272 | 6,656,062 | 150,239 | 6,142,955 | 8,033 | 513,107 | 180,506 | 7,972,271 | 171,246 | 7,519,803 | 9,260 | 452,468 |
| Centrifugal refrigeration machines | 84 | 2,086,789 | 63 | 1,631,291 | 21 | 455,498 | 71 | 1,558,179 | 58 | 1,378,533 | 13 | 179,646 |
| Heat exchanger equipment | | 11,946,123 | | 11,056,219 | | 889,904 | | 14,140,820 | | 13,381,388 | | 759,432 |
| Evaporative condensers | 1,556 | 1,924,579 | 1,407 | 1,768,526 | 149 | 156,053 | 1,541 | 1,844,920 | 1,460 | 1,765,917 | 81 | 79,003 |
| Unit coolers | 33,227 | 4,797,278 | 29,864 | 4,356,959 | 3,363 | 440,319 | 40,570 | 5,498,214 | 37,431 | 5,136,933 | 3,139 | 361,281 |
| Air conditioning | 4,032 | 1,492,847 | 3,476 | 1,354,631 | 556 | 138,216 | 5,087 | 1,767,027 | 4,796 | 1,701,872 | 291 | 65,155 |
| Refrigeration | 29,195 | 3,304,431 | 26,388 | 3,002,328 | 2,807 | 302,103 | 35,483 | 3,731,187 | 32,635 | 3,435,061 | 2,848 | 296,126 |
| Other heat exchanger equipment[3] | | 5,224,266 | | 4,930,734 | | 293,532 | | 6,797,686 | | 6,478,538 | | 319,148 |
| SECTION II—SELF-CONTAINED AIR CONDITIONING UNITS AND ICE MAKING MACHINES | | | | | | | | | | | | |
| Self-contained air conditioning units | 15,854 | 9,094,060 | 14,670 | 8,454,121 | 1,184 | 639,939 | 25,240 | 10,626,892 | 23,274 | 9,767,959 | 1,966 | 858,933 |
| Room type | 7,927 | 1,818,474 | 7,021 | 1,483,112 | 906 | 335,362 | 18,397 | 4,056,034 | 16,799 | 3,486,851 | 1,598 | 569,183 |
| Other than room type | 7,927 | 7,275,586 | 7,649 | 6,971,009 | 278 | 304,577 | 6,843 | 6,570,858 | 6,475 | 6,281,108 | 368 | 289,750 |
| Ice making machines | 1,866 | 627,761 | 1,722 | 489,899 | 144 | 137,862 | 973 | 517,099 | 897 | 489,861 | 76 | 27,238 |

*Revised.
[1]Continental United States.
[2]Includes Canada, Mexico, and United States territories.
[3]Includes condensers and liquid coolers, shell and tube and shell and coil types, as well as fin coils (heating and cooling) and plate type evaporators.

# NOW AVAILABLE

## LARGE SIZES OF REVERE COPPER WATER TUBE FOR SOIL, WASTE AND VENT STACKS

YOUR Revere Distributor can supply Revere Copper Water Tube *now* in the large sizes needed for soil, waste and vent stacks in home or commercial construction.

Revere Copper Water Tube is the ideal material for drainage and vent systems because:

1. It is highly resistant to corrosion, which assures a longer life for the system.
2. Its permanently smooth interior surfaces provide free, unobstructed flow.
3. Joints made with solder fittings save time and thus lower the cost of installation.

In drainage systems—just as in heating, water supply and air conditioning—*trouble always costs more than Revere Copper Water Tube.* Each length of this tube is stamped at regular intervals with the Revere name and the type. These marks are more than identification—they are your assurance of full wall thickness and the close gauge tolerances so essential for tight soldered joints.

You can specify or install, in addition to Revere Copper Water Tube, such other long-lived materials as Red-Brass Pipe; Sheet Copper and Herculoy for tanks, ducts, pans and trays; Dryseal Copper and Aluminum Refrigeration Tube (dehydrated and sealed); Copper oil burner, heat control and capillary tubes. The Revere Technical Advisory Service is always ready to serve you. Call your Revere Distributor.

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ers of components and accessories and complete air conditioning equipment. Estimates were made for a few companies, representing only a small portion of the total industry, that did not submit their reports in time to be tabulated. The data included in the release are believed to represent substantially all component manufacturers and air conditioning equipment producers.

The shipment statistics included in the report apply to equipment actually billed and shipped. These figures are equivalent to complete sales. Complete units delivered on consignment or shipped to a branch warehouse for stocks are not included until such time as they are actually sold. The dollar values shown in Table 1 are net billing prices, f.o.b. factory.

Table 1 presents summary data on domestic and export shipments for the second and third quarters of 1947. Detailed information on a breakdown of these products by size and type for the third quarter is given in the full report available from the Bureau of the Census.

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## GROUND WATER REGULATION

**urged by Illinois official to curb excessive withdrawal for air conditioning and refrigeration.**

Regulation of the use of water for air conditioning and refrigerating installations in Illinois was suggested by A. M. Buswell, chief of the state water survey division, in a report on Illinois water resources.

• **DEFICIENCY.**—A comprehensive program of water control and conservation in Illinois was recommended by the report, which cites five ground water deficiency areas in the state, including the areas around Chicago and that around Joliet.

The practice of "once through" use of ground water for air conditioning was listed by Mr. Buswell as an illustration of water waste in some communities which could be curbed.

Such use is limited by sewer capacity in the Chicago loop area, he said, but declared that in Champaign-Urbana over-development of existing well fields has made it necessary to discontinue the use of air conditioning and refrigerating installations not provided with water salvaging equipment.

• **INDIANA LAW.**—Mr. Buswell pointed out that an Indiana law effective this year makes it unlawful for anyone to remove more than 200 gallons per minute of water from the ground or by any means and use it for air conditioning or cooling of air purposes unless the water is circulated through cooling devices and re-used, or returned to the ground through recharging wells. The return to the ground, under the Indiana measure, must be through a closed system, approved by the state health board.

• **USE INCREASE.**—Water use in Illinois in the next 15 years will increase from the current rate of about 1,500 million gallons a day to more than 2,200 million gallons, Mr. Buswell predicted. The figures do not include an estimated 4,000 million gallons a day used from surface sources for condensing purposes in steam power plants.

Pointing to the need of conserving ground water and shifting to surface water supplies, which are ample, Mr. Buswell contended that to do these things adequately will require new legislation and new cooperation among state departments charged with various phases of water control.

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## SNOW MELTING SYSTEM

**in heated Belmont road opens way to hilltop dwellers formerly isolated by storms.**

There have been numerous instances of driveways heated to melt off snow and ice, but in the town of Belmont, Mass. there is a quarter mile of heated roadway that takes care of snowfall for some nine families living on top of Snake Hill.

• **ISOLATION.**—Were it not for this system of snow-melting underground piping, the Snake Hill population would be without rubbish and garbage collections, food and fuel deliveries and other conveniences. Besides they would have to labor up or down the 18 to 20 degree grade, through several feet of snow drifts. For five winters previous to the laying of the double run of pipes under the roadway (at their own expense) on either side of the road, the people living there had to trudge up and down to shopping areas and their cars were often stuck in huge drifts.

• **REMEDY.**—A heating plant with boiler, oil storage tanks and an oil burner of about the size necessary to heat a 12-room house circulates hot water through the system, from the top to the bottom of the hill. "We'd had enough plowing through snowdrifts last year, after five winters on the top of the hill," says Gardner Cushman, secretary of the Snake Hill Trust, representing all the residents. "It was then that we started to install the heating system at a cost of $3,500. For the 1947-48 winter the cost of oil will have been less than $200 to heat the road."

The heating system does the work equivalent to 100 shovellers and clears the entire road of a 12-in. snowfall in three hours. When the snow starts falling one family halfway up the grade turns a switch and the snow, if not too heavy, melts as fast as it lands. If the snow is too heavy and the wind too high, the heater will not keep up with the snowfall. But it will clear the road of any accumulation within 24 hours after the snow stops. A half-and-half combination of water and anti-freeze solution keeps the system from freezing, down to —20F.

• **EXPERIENCE.**—There have been certain problems in pioneering this longest stretch of road heating in all New England. It was found that the boiler room would better have been located near the bottom of the hill. As it is, the system does a better job of clearing

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Then, too, there is a fine mist of paint in the air around the booth, in spite of water curtains and other precautions. If this mist were to contact air-cooled motors, located just outside of the spray booth, and their electrical controls, frequent and costly shutdowns would result. This equipment room, too, is protected by DUST-STOP Air Filters.

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the highway nearest the top of the hill. A larger storage capacity for fuel oil would have saved some worries; there are now two tanks with total capacity of 550 gallons. More pipes are needed on curves where wider spacing of automobile tracks is required. Air pockets at the top of the system were licked by installation of two expansion tanks.

## BUILDING FORUM

**sets up outline of building design trends, with emphasis upon materials and structural housing problems facing the building industry.**

Under the auspices of the Architectural Department of the Pennsylvania State College, and leaning heavily upon facilities centered in the Engineering Experiment Station at State College, a Building Forum and Clinic dedicated to the more pressing problems facing the current housing program attracted engineers and architects from eastern states to the campus of the Pennsylvania State College February 11 and 12.

"Old Main," traditional landmark of the State College campus.

Chairman and organizer of the meetings was Kenneth J. Heidrich, professor, Department of Architecture. The Building Forum and Clinic, said Professor Heidrich, was arranged to stimulate greater cooperation between the various persons and agencies in the field of building and to provoke interest, by open discussion, in trends and practices which may improve the building process.

• **DESIGN TRENDS.**—Housing design trends were discussed by W. H. Scheick, coordinator, Small Homes Council, University of Illinois. Mr. Scheick stated the purpose of his paper to be an attempt to look into the future through the eyes of the research agency with respect to design and technical developments. The object of present day research is to concentrate on improvements in small, low-cost houses rather then the larger structures associated with upper income brackets. Progress can be expected in basic design by reduction of the structure to a minimum number of parts and assembly operations. Mr. Scheick outlined the fundamentals of modular construction and showed how simplification of basic dimensions might affect future housing design. Progress can be expected, also, in financing techniques, the unification of the housing industry, the unification of codes, and elimination of restrictive labor practices.

Designers today, said Mr. Scheick, can build anything. They are limited only by costs. Costs in the future will be reduced by good use of land in community planning, good orientation as typified by the solar house, functional use of space, and flexibility of basic structure so that variety and contingency additions to a structure will be possible.

The immediate future can expect no new miracle materials, Mr. Scheick said. Progress has been made in development of new sheet materials but these are, in general, merely laminations of old basic products. Greatest advances are being made in structural combinations of materials. The outcome of present research should be basic standardization with a view to the preservation of flexibility. Examples of such development are the utility core, modular construction, and storage walls.

• **SOCIOLOGY.**—Sociological problems confronting the building industry, and especially architects, were discussed by Dr. Walter Coutu, assistant professor of sociology, the Pennsylvania State College. Dr. Coutu pointed to the engineered utility of commercial and manufacturing buildings including barns. These buildings are good, said Dr. Coutu. Houses are not.

Houses have come to their sorry present day condition, Dr. Coutu said, because people do not know what they want in houses—even if they think they do—and architects give in to the whims of their clients rather than prescribing the functional and spacial requirements for good living. Medical doctors prescribe, he pointed out, why don't architects?

The normal functions of a family, Dr. Coutu said, are the preparation and serving of meals—not food—the physical and mental hygiene of family members, rest, recreation, and privacy. Architects must study the basic requirements of human family life, stop wasting unusable space in bedrooms, provide places where the family can act as a unit, and provide other places where members of the family can be individuals.

• **PHYSIOLOGY.**—Physiological findings relative to health and comfort were discussed by Dr. L. P. Herrington, director of research, John B. Pierce Laboratory of Hygiene. Dr. Herrington discussed the effects of temperature and humidity upon comfort, physiology, and psychology. Chief index of comfort, says Dr. Herrington, is skin temperature. When the surface of the body is hot, blood is rushed to the surface to act as a coolant. This occurs at the expense of other blood functions, oxydation and nutrition. Hence, we experience a feeling of depression. Comfort can be predicted from observed combinations of wall and air temperature, air movement, and humidity.

The ideal condition for comfort, said Dr. Herrington, provides cool air in the presence of radiant warmth. The possible range of temperatures and humidities for

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comfort are outlined in standard references, Dr. Herrington pointed out, but for nose and throat comfort, high wall and low air temperatures are desirable.

The exact limits of surface temperatures for comfort have not been clearly defined, but it can be shown that a floor temperature over 80F tends to dilate the blood vessels in the feet and depresses functions of the rest of the body. A ceiling surface temperature over 105F produces excessive direct radiation on the head.

Control of bacterial content in the air, Dr. Herrington stated, has been quite thoroughly investigated with respect to ultra-violet light and chemical disinfectants such as triethylene glycol. A type of disinfectant which has not received its full share of present day research has been the thermal treatment of air. Dr. Herrington cited the old-fashioned hot air furnace, heating air to 400 or 500F. These were extremely efficient with respect to air disinfection. If the comfort requirements of modern heating plants could be retained with the sanitary advantages of the old hot air furnace, the combination would be ideal.

• **CONDENSATION.**—Condensation control methods were discussed by Everett R. McLaughlin, assistant professor of engineering research, the Pennsylvania State College, in a paper prepared jointly with Prof. E. R. Queer. Modern conditions, Mr. McLaughlin pointed out, are conducive to condensation of moisture on walls. Tight structure, indoor drying of laundry, freer use of water for washing and cooking, gas combustion in kitchen stoves, all contribute to producing and retaining high humidities indoors. Where walls are not designed to remain below the dewpoint of the inside air conditions, condensation will occur. If the dewpoint is reached at a point within the wall, Mr. McLaughlin pointed out, vapor may penetrate through the structural materials and condense within the wall itself.

By reducing internal humidities to the minimum practical point, that is, by restriction of evaporation of moisture within the house, condensation on inside surfaces can frequently be eliminated. The use of a vapor barrier on the inside surface of the wall will prevent the penetration of moisture through the structural materials and thus will prevent condensation within the walls. Another means of preventing condensation in stud spaces is to ventilate the space by openings to the outside air. About 1 sq in. per linear ft of wall will be found sufficient to ventilate stud spaces. Condensation in attic spaces can be controlled by louvered openings in the end walls of the attic. These openings should be at least 1/300 of the attic floor area. Design for condensation control is a better solution to this problem than attempts to remedy a condensation problem after it develops.

• **FUNCTIONAL STANDARDS.**—Housing cost reduction through functional, rather than specification requirements, in building standards was discussed by Ralph R. Britton, chief structural and architectural engineering advisor, Housing and Home Financing Agency. The difficulties and cumbersome nature of exact material specifications in building standards were emphasized by a list of thirty-one requirements for a wall listed by Mr. Britton. In a plea for unified nationwide standards, Mr. Britton pointed out that, where functional rather than specification standards are set up, the flexibility of the standard is insured, and many of its restrictive faults eliminated. The Housing and Home Finance Agency has developed a basic functional standard for housing. Mr. Britton pointed out that a specification standard listing actual materials and combinations can be included as a local supplement to any basic functional standard and might serve a useful purpose especially among small builders.

• **CONTRACTOR.**—A plea for closer cooperation between architect and contractor was entered by G. J. Lauter, director, Society of General Contractors of America. One way to cut costs, said Mr. Lauter, is for the architect to confer with the contractor during the design and specification of special types of industrial and commercial buildings. Architects should submit complete working drawings when requesting bids in order to avoid subsequent discord. For instance, Mr. Lauter pointed out, if a material or structural combination is not exactly specified at the time of bidding and is later requested by the architect, there will be trouble if the contractor has not allowed for this contingency in his original estimate.

• **FINANCE.**—Present day practices in house financing were discussed by T. Allen Glenn, Jr., president, The Peoples National Bank of Norristown, Pa. Mr. Glenn cited conditions contributing to the depression of the 30's. Mortgage lending practices today, said Mr. Glenn, are more sound and more conducive to stability. For instance, the buyer of a modern house acquires equity in his house as soon as monthly payments begin. This was not the case in pre-depression practice. Even though housing prices may decline, Mr. Glenn believes that purchasers of present houses even at inflated values will retain their houses because of their equity in them and the probability that other facilities will prove less advantageous.

• **SALESMANSHIP.**—At a dinner meeting under the chairmanship of B. K. Johnstone, director, College of Fine Arts, Carnegie Institute of Technology, a talk entitled "Accelerating the Acceptance of New Materials" was delivered by Tyler S. Rogers, assistant to the executive vice-president, Owens-Corning Fiber-Glas Corp. Mr. Rogers pointed out that most of the houses erected today are made up of materials which could have been included in any house built during the past fifteen or twenty years. Citing the complexity of the building market made up of thousands of designers, specifiers, contractors, and subcontractors of various types and functions such as plasterers, plumbers, etc., Mr. Rogers urged the necessity of promoting new materials by reaching all these individuals with a complete sales message including descriptions of the materials, ways in which they are used and prices. Manufacturers, publications, schools, and advertising personnel should reexamine the problem of disseminating information about new products and exert their energies towards more detailed description and wider acceptance of new materials.

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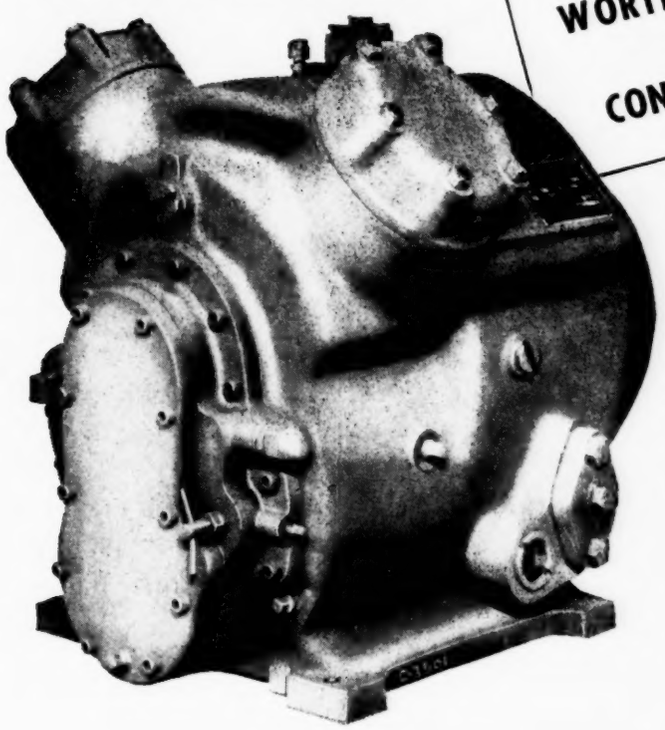

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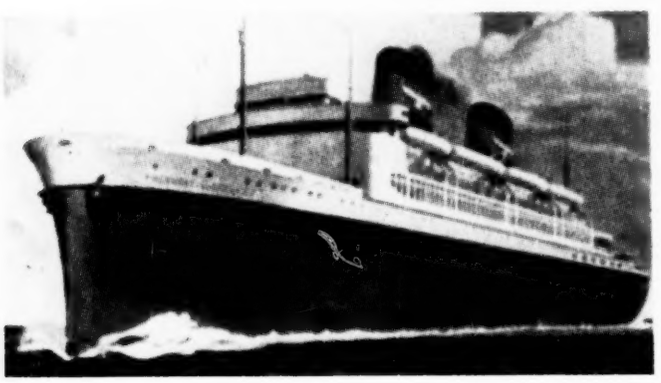
## MARINE REFRIGERATION

**for passenger comfort and cargo storage featured in new Presidential liner.**

The steamship *President Cleveland*, one of America's largest and most luxurious liners built since the war, sailed on her maiden voyage from San Francisco to Honolulu. Yokohama, Manila and midway points, December 27. The new liner is of 23,000 tons displacement and carries 550 passengers. She was launched at the Bethlehem-Alameda Shipyards in California, in June, 1946. Six hundred and ten feet long, the vessel is driven at 21 knots by turbo-electric motors generating 20,000 hp.



The President Cleveland

• **FOR LIVING.**—Among many modern features, the President Cleveland has two swimming pools, an air conditioning system for public spaces and state rooms, first-class state rooms with individual baths, newest life boats (two of which are equipped with motors and radio), and such instruments as gyro-compasses, echo depth sounder, radio direction finder, public address system, fire detection and control system, a complete hospital unit, children's playroom, movies, gymnasium and beauty parlor.

• **FOR CARGO.**—Specially insulated compartments carry 600 tons of perishables at —5F. Most of the remaining 3900 tons of cargo is under humidity control. There are 13 refrigerated cargo compartments on the vessel. Three of these are in the hold, while the others are on C and D decks. The spaces vary in size from 2450 to 6000 cu ft each. The total refrigerated volume is nearly 55,000 cu ft.

Eggs, meat, and vegetables in the frozen state are stored at —10F, but part of the frozen meat is held at 0F. Some fresh vegetables and fruits are stored at 35F, with a change of air once per hour; others are held at 55, and have three air changes per hour. The temperatures are controlled by modulated thermostatic regulating valves.

Brine is carried at two temperature levels. Hot brine, heated by steam, is piped to the room coolers for defrosting; a signal system permits the operator to notify the machinery room when cold brine is again wanted. The unit air coolers are of the vertical marine type, with galvanized finned coils. Cold brine is furnished from three shell-and-tube coolers, each 20 in. in diameter and 9 ft long, and having 378 red brass tubes of $\frac{5}{8}$-in. size. Inserted in the Freon suction lines are three gas-and-liquid heat exchangers, of approximately half the size of the coolers.

• **EQUIPMENT.**—Each of the three compressors is a Frick 13-$\frac{1}{4}$ by 9, two-cylinder machine, driven by a d-c motor of 100 hp. The compressors have automatic capacity controls.

The receivers are 12 in. in diameter and 10 ft long. Everything is arranged in triplicate. There are three high-pressure cutouts, three condensing water regulating valves, three sets of low-pressure switches, high- and low-pressure gauges, condensing water gauges, Freon-12 strainers and dehydrators, liquid solenoid valves, thermal expansion valves, and plain thermostats. There are a total of 23 thermometers for the refrigerant lines, brine lines and air ducts, plus 13 indicating room thermometers. Also an electric-resistance indicating thermometer arranged for reading at 24 points. For food service, the ship uses six Frick low pressure refrigerating units. These machines cool 10 storage boxes, and, in addition, are connected to an ice making system and a galley refrigerator.

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## MINERAL RESOURCES

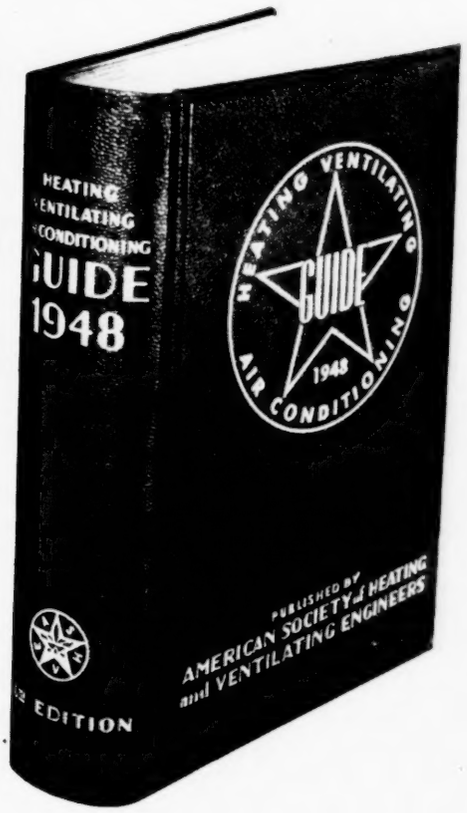
**probed and developed in active year by Bureau of Mines, year-end report reveals.**

Spurred on by the demands for a strong world mineral position, the Bureau of Mines during the fiscal year 1947 uncovered new deposits of copper, iron, lead, and zinc, improved methods of treating low-grade ores, started the first production of crude oil from Naval oil shale reserves of Colorado, and provided widely diversified technologic and economic services to the extractive industries, according to the annual report of Secretary of the Interior J. A. Krug.

Recognition of the intensified interest in the status of this Nation's mineral resources and their importance to economic and military survival influenced the Bureau's broad program which also included research in coal and coal productions, explosives, mine safety and mining methods, petroleum and natural gas, helium production, fuel efficiency, and economic and statistic surveys, Director James Boyd said in the Bureau's annual report.

• **EXPLORATION.**—Because of the continued shortage of lead and zinc, 36 of the 62 explanatory projects on which development work was done in 26 states and Alaska were concerned with these metals. Thirteen other commodities were sought in 26 additional projects developed after preliminary examination of 275 deposits of strategic and critical minerals.

• **FOUND.**—Adding to the Nation's mineral reserves, Bureau research accounted for 1,200,000 tons of ore

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containing 2.3 percent copper; 19,000,000 tons of magnetic iron ore assaying 26 percent iron; 363,000 tons of lead-zinc ore containing 2.5 percent lead and 4.7 percent zinc; 21,000,000 tons of black sand deposits composed of 54 percent titanium, 15 percent zircon, 14 percent staurolite, and other minerals; a mica deposit of 100,000 tons containing 5 percent sheet mica; and a barite deposit of 220,000 tons containing 68 percent barium sulfate.

In the field of pure metal production, the Bureau again pioneered in developing electrolytic cobalt, extended the use of electrolytic manganese and chromium in ferroalloys and sponge iron as a scrap substitute, and provided sufficient titanium for experimental use in high-temperature resistant materials. New nonmetallic products were developed for use as concrete aggregate and for home insulation.

• **OIL SHALE.**—The production of oil from Colorado Naval oil shale reserves was realized last year with the opening of a 100-barrel-a-day oil-shale demonstration plant near Rifle, Colo. New laboratory facilities were completed at Laramie, Wyo., conversion of a wartime ammonia plant at Louisiana, Mo., was started, and new pilot plants and laboratories were nearing completion at Pittsburgh, Pa., and Bruceton, Pa.

As these significant advances were being made in the production of synthetic liquid fuels from coal, lignite, and oil shale, heavier drains were made on this Nation's petroleum reserves and the Bureau continued emphasis on improved extraction methods of including secondary recovery, more efficient utilization of crude oils, and processes to make less desirable crudes usable.

• **COAL.**—Thousands of improvements were effected in the Nation's bituminous-coal mines during the period of Government operation last year under the Federal Mine Safety Code. Federal inspectors made more than 4,600 regular and special inspections, and approximately 16,000 gas and dust samples were analyzed in the promotion of safety in the mineral industries. Bureau engineers aided at mine disasters and investigated 47 explosions and mine fires and 84 miscellaneous accidents. First-aid training and mine-rescue instruction was given to 29,988 persons and accident-prevention courses were given to 3,245.

To aid the peacetime steel industry, usable reserves of more than 500 million tons of good quality coking coal were charted in Maryland and Alabama, and renewed efforts were made to up-grade lower-quality coals. As a part of the fuels utilization services that have been credited with the saving of thousands of dollars in Government establishments, the Bureau recommended fuel-burning equipment for 38 new veterans' hospitals.

• **HELIUM.**—More than one-fifth of the Nation's helium production of 63,000,000 cu ft last year was diverted to industrial, commercial, and medical users, more than nine times the volume sent to these outlets in prewar years. Helium reserves were increased with the acquisition of the Rattlesnake gas field on the Navajo Indian Reservation in New Mexico.

## ALUMINUM OIL TANKS

**now covered by Underwriters' temporary standard after cooperative tests.**

The current shortage of sheet steel combined with the high installation rate of domestic oil burners has resulted in considerable agitation for the fabricating of inside storage tanks for oil burners from aluminum instead of steel (H&V:1:48:p122).

• **ACCEPTABLE.**—Underwriters' Laboratories, Inc. in co-operation with the Oil Heat Institute of America, the Technical Committee on Fuel Tanks Sheet Division of the Aluminum Association, and several tank manufacturers, has conducted a series of tests and conferences to determine if aluminum tanks could be constructed which would comply with the strength requirements for steel tanks as outlined in the Standard for Inside Tank Equipment for Oil Burners. Test results indicated acceptable tanks can be made from aluminum. These tanks are now covered by Temporary Standard for Aluminum Inside Storage Tanks for Oil Burners.

This Standard applies to aluminum tanks of capacities of 275 gal or less, intended for use in basements of buildings for the storage and supply of fuels for oil burners when suitable automatic safeguards are provided to avoid the abnormal discharge of oil at the burner.

## NEWS BRIEFS

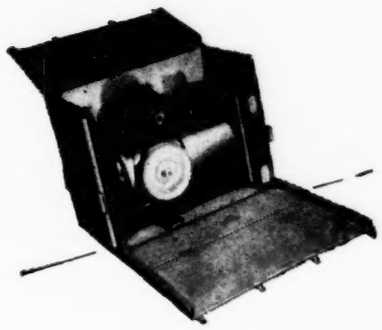
• **The Gonzales (Texas) Warm Springs Foundation will equip three major buildings of its infantile paralysis treatment center with year-around air conditioning at a cost of $400,000.**

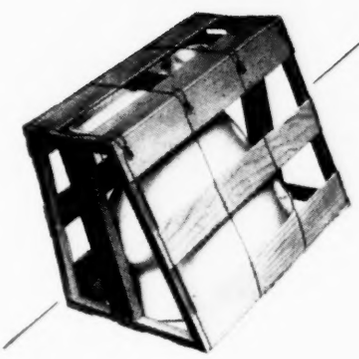
• Office quarters of the U. S. Delegation to the United Nations at 2 Park Avenue, New York, have been equipped with 26 Carrier room air-conditioning units to provide the delegates with comfortable working conditions.

• During 1947, the gas utility and liquefied petroleum gas distribution systems added more than 1,000,000 homes, bringing to 25,000,000, the number of homes served by the gas industry, according to John A. Robertshaw, president of the Gas Appliance Manufacturers Association.

• Northeastern University's expansion program includes its civil engineering department's newly completed *temperature-humidity controlled cement and concrete testing laboratory.* The lab, covering 1300 sq ft, is divided into three sections: an aggregate preparation room, cement testing and office space, and concrete mixing, casting and testing area. The latter two sections are temperature and humidity controlled.

# for safe arrivals





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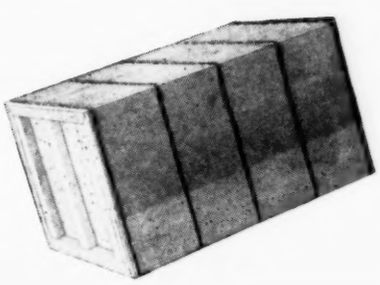
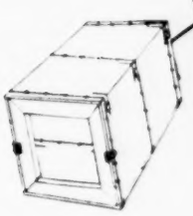
The light weight, resilient construction of **Wirebound** Boxes and Crates offers safer, lower cost shipping that benefits the dealer, wholesaler and manufacturer alike. **Wirebounds** combine the strength of steel with thinner wood . . . a time-tested combination that withstands the shocks of rough handling in all phases of warehousing and shipping. This means lower shipping charges, reduced damage, and fewer losses of time and money on returned goods. Every **Wirebound** is specifically designed to meet the requirements of each product carried . . . whether it is heavy hardware, component parts, a product with enameled surfaces or constructed of thin sheet metal sections. **Wirebounds** are easier to handle, easier to unpack and can often be reused.

**Yes,** if it's shipped Wirebound you can be sure it's shipped right!





**Wirebound**
**BOXES & CRATES**

WIREBOUND BOX MANUFACTURERS ASSOCIATION
ROOM 1831 BORLAND BUILDING, CHICAGO 3, ILLINOIS

# DEGREE-DAYS FOR JANUARY, 1948

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

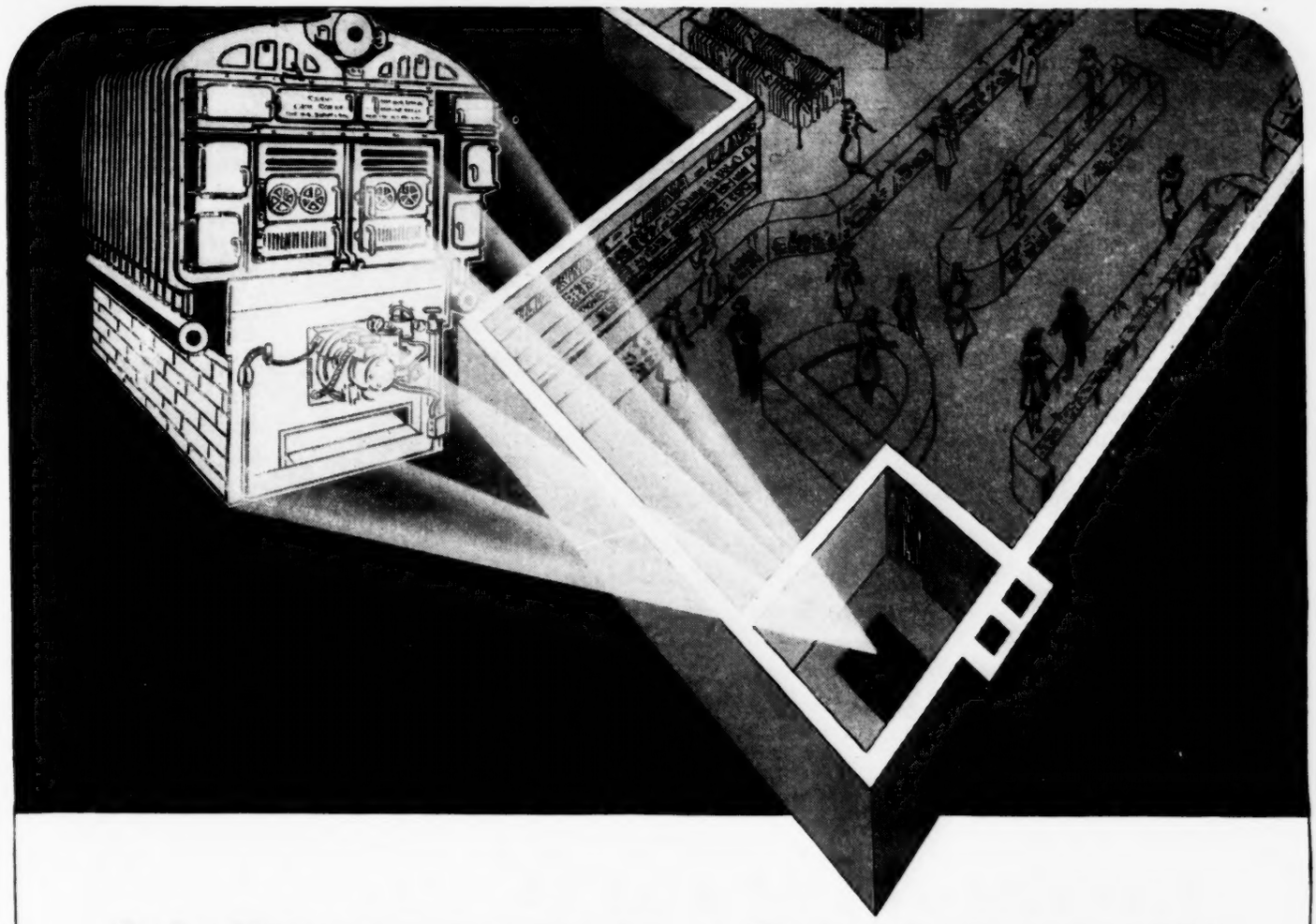
| City | January | | | Cumulative, Sept. 1, 1947 to Jan. 31, 1948 | | | Heating Season[1] |
|---|---|---|---|---|---|---|---|
| | 1948 | 1947 | Normal | 1948 | 1947 | Normal | Normal |
| Abilene, Texas | 803 | 727 | 326 | 1808 | 1557 | 1251 | 2061 |
| Albany, New York | 1537 | 1213 | 1287 | 4181 | 3453 | 3726 | 6580 |
| Albuquerque, New Mexico | 970 | 991 | 924 | 2818 | 2743 | 2751 | 4298 |
| Alpena, Michigan | 1509 | 1296 | 1431 | 4150 | 3964 | 4382 | 8299* |
| Anaconda, Montana | 1293 | 1381 | 1321 | 4480 | 4915 | 4492 | 8357** |
| Asheville, North Carolina | 1013 | 669 | 831 | 2582 | 1994 | 2520 | 4232 |
| Atlanta, Georgia | 842 | 592 | 682 | 1960 | 1404 | 1813 | 2890 |
| Atlantic City, New Jersey | 1107 | 734 | 992 | 2762 | 2010 | 2727 | 5176 |
| Augusta, Georgia | 703 | 420 | 555 | 1631 | 1050 | 1441 | 2161 |
| Baker, Oregon | 919 | 1348 | 1218 | 3627 | 4286 | 4033 | 7163 |
| Baltimore, Maryland | 1104 | 728 | 955 | 2699 | 1951 | 2619 | 4533 |
| Billings, Montana | 1119 | 1195 | 1318 | 3883 | 4202 | 4134 | 7119 |
| Binghamton, New York | 1455 | 1045 | 1268 | 3823 | 3073 | 3783 | 6808 |
| Birmingham, Alabama | 875 | 526 | 589 | 1937 | 1356 | 1502 | 2352 |
| Bismarck, North Dakota | 1669 | 1449 | 1807 | 5155 | 5082 | 5321 | 9192 |
| Block Island, Rhode Island | 1165 | 897 | 1048 | 3030 | 2424 | 2784 | 5788 |
| Boise, Idaho | 993 | 1294 | 1097 | 3358 | 3788 | 3382 | 5552 |
| Boston, Massachusetts | 1294 | 1004 | 1150 | 3383 | 2747 | 3280 | 6045 |
| Bozeman, Montana | 1321 | 1351 | 1403 | 4528 | 4642 | 4689 | 8521** |
| Buffalo, New York | 1443 | 1087 | 1240 | 3745 | 3119 | 3612 | 6822 |
| Burlington, Vermont | 1632 | 1367 | 1429 | 4480 | 3857 | 4202 | 7514 |
| Butte, Montana | 1393 | 1475 | 1309 | 4844 | 5182 | 4492 | 8235** |
| Cairo, Illinois | 1109 | 758 | 908 | 2539 | 1897 | 2407 | 3909 |
| Canton, New York | 1661 | 1418 | 1520 | 4600 | 4052 | 4514 | 8020 |
| Charles City, Iowa | 1584 | 1272 | 1560 | 4338 | 3860 | 4455 | 7588 |
| Charleston, South Carolina | 630 | 281 | 487 | 1306 | 716 | 1119 | 1769 |
| Charlotte, North Carolina | 871 | 564 | 725 | 2138 | 1476 | 1945 | 3120 |
| Chattanooga, Tennessee | 967 | 652 | 732 | 2247 | 1742 | 1957 | 3118 |
| Cheyenne, Wyoming | 1259 | 1184 | 1215 | 4033 | 4031 | 4104 | 7466 |
| Chicago, Illinois | 1377 | 1052 | 1190 | 3466 | 2922 | 3362 | 6077 |
| Cincinnati, Ohio | 1210 | 787 | 1017 | 2879 | 2155 | 2813 | 4684 |
| Cleveland, Ohio | 1391 | 998 | 1181 | 3515 | 2812 | 3366 | 6155 |
| Columbia, Missouri | 1241 | 948 | 1110 | 2906 | 2488 | 3006 | 4922 |
| Columbia, South Carolina | 741 | 431 | 586 | 1719 | 1075 | 1502 | 2364 |
| Columbus, Ohio | 1324 | 904 | 1113 | 3240 | 2523 | 3133 | 5398 |
| Concord, New Hampshire | 1579 | 1339 | 1349 | 4394 | 3889 | 4081 | 7353 |
| Concordia, Kansas | 1207 | 1048 | 1184 | 3190 | 2987 | 3203 | 5315 |
| Dallas, Texas | 810 | 598 | 617 | 1743 | 1315 | 1487 | 2256 |
| Davenport, Iowa | 1435 | 1129 | 1352 | 3648 | 3095 | 3685 | 6289 |
| Dayton, Ohio | 1391 | 972 | 1116 | 3501 | 2743 | 3063 | 5264 |
| Denver, Colorado | 1084 | 983 | 1079 | 3234 | 3202 | 3355 | 5874 |
| Des Moines, Iowa | 1375 | 1158 | 1392 | 3657 | 3301 | 3762 | 6384 |
| Detroit, Michigan | 1408 | 1105 | 1252 | 3688 | 3069 | 3584 | 6490 |
| Devils Lake, North Dakota | 1838 | 1597 | 1949 | 5639 | 5587 | 5820 | 9970 |
| Dodge City, Kansas | 1126 | 1022 | 1116 | 3102 | 2900 | 3068 | 5035 |
| Dubuque, Iowa | 1514 | 1217 | 1442 | 3928 | 3434 | 3976 | 6790 |
| Duluth, Minnesota | 1808 | 1547 | 1727 | 5292 | 5110 | 5216 | 9483 |
| Eastport, Maine | 1438 | 1309 | 1380 | 4109 | 3869 | 4270 | 8520** |
| Elkins, West Virginia | 1343 | 846 | 1048 | 3528 | 2796 | 3265 | 5697 |
| El Paso, Texas | 758 | 773 | 629 | 1946 | 1824 | 1667 | 2428 |
| Ely, Nevada | 1125 | 1397 | (a) | 4188 | 4589 | (a) | (a) |
| Erie, Pennsylvania | 1324 | 1000 | 1172 | 3362 | 2714 | 3336 | 6273 |
| Escanaba, Michigan | 1640 | 1389 | 1550 | 4464 | 4326 | 4688 | 8771 |
| Evansville, Indiana | 1230 | 836 | 949 | 2964 | 2307 | 2494 | 4244 |
| Fort Smith, Arkansas | 979 | 725 | 850 | 2193 | 1745 | 2027 | 3147 |
| Fort Wayne, Indiana | 1449 | 1100 | 1194 | 3760 | 3114 | 3405 | 5925 |
| Fort Worth, Texas | 826 | 614 | 580 | 1760 | 1339 | 1406 | 2148 |
| Fresno, California | 426 | 745 | 583 | 1538 | 1917 | 1494 | 2334 |
| Galveston, Texas | 540 | 403 | 353 | 948 | 725 | 683 | 1016 |
| Grand Junction, Colorado | 1227 | 1327 | 1233 | 3585 | 3689 | 3511 | 5548 |
| Grand Rapids, Michigan | 1395 | 1142 | 1262 | 3650 | 3157 | 3659 | 6535 |
| Green Bay, Wisconsin | 1674 | 1356 | 1538 | 4451 | 4079 | 4420 | 7825 |
| Greensboro, North Carolina | 979 | 649 | 772 | 2531 | 1864 | 2167 | 3529 |
| Greenville, South Carolina | 897 | 589 | 744 | 2144 | 1517 | 2078 | 3380 |
| Harrisburg, Pennsylvania | 1282 | 901 | 1088 | 3254 | 2590 | 3069 | 5375 |
| Hartford, Connecticut | 1396 | 1063 | 1159 | 3705 | 2993 | 3316 | 6036 |
| Hatteras, North Carolina | 718 | 337 | 589 | 1492 | 828 | 1316 | 2571 |
| Havre, Montana | 1166 | 1319 | 1624 | 4217 | 4994 | 4938 | 8700 |
| Helena, Montana | 1235 | 1398 | 1375 | 4324 | 4856 | 4433 | 7894** |
| Houston, Texas | 574 | 414 | 366 | 1053 | 768 | 815 | 1157 |
| Huron, South Dakota | 1652 | 1294 | 1650 | 4823 | 4405 | 4735 | 8004 |
| Indianapolis, Indiana | 1305 | 926 | 1128 | 3245 | 2500 | 3130 | 5298 |
| Jackson, Mississippi | 789 | 506 | (a) | 1604 | 1116 | (a) | (a) |
| Kansas City, Missouri | 1235 | 987 | 1141 | 2960 | 2545 | 3007 | 4956 |
| Kewanee, Illinois | (a) | 1124 | 1223 | (a) | 3111 | 3534 | 6139 |
| Knoxville, Tennessee | 1003 | 658 | 815 | 2343 | 1822 | 2298 | 3670 |
| La Crosse, Wisconsin | 1676 | 1358 | 1535 | 4629 | 4102 | 4313 | 7322 |
| Lander, Wyoming | 1412 | 1412 | 1436 | 4503 | 4602 | 4511 | 7947 |

(a) Data not available.

[1] Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with nine exceptions, based on local weather bureau reports. Exceptions are Utica, Lewiston, Kewanee, Sioux City, and Jackson, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; Norman E. Ross, Bursar, Bates College, Lewiston, Me.; J. M. Hartman, Engineering Department, Kewanee Boiler Corp., Kewanee, Ill.; Alfred R. Wagstaff, Engineer, Sioux City Foundry and Boiler Co., Sioux City, Iowa; and H. M. Ludlow, Box 1368, Jackson, Miss., respectively; Anaconda, Bozeman, Butte and Livingston, Mont., through the courtesy of the Montana Power Company.

Table concluded on Page 136

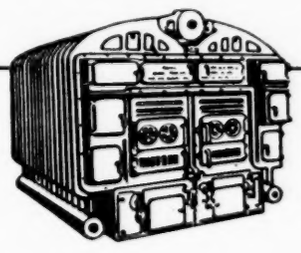


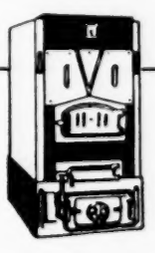
# A boiler room can be a bargain basement!

Chain stores can't take in money over counters that don't exist. Architects know that the smaller the boiler room, the greater the basement area that can be devoted to storing, displaying and *selling* merchandise. Heating contractors often show the way to smaller boiler rooms by specifying Smith-Mills boilers . . . because Smith-Mills boilers are constructed of cast iron, therefore do not need large open working spaces in front of the boiler for replacement of tubes.

Because Smith-Mills boilers have plenty of heating surface to efficiently absorb heat generated by intense, blast-like oil, gas or stoker flames — even at peak firing rates — they are outstandingly efficient for automatic firing. This fact means, too, that they deliver maximum heat per square foot of basement space.

Yes, a boiler room can be a bargain basement . . . or a classroom, ward or tool room. In store or school, hospital or factory, Smith-Mills boilers are saving valuable space — and money, too. Write for the *facts*.





H.B. Smith

**CAST-IRON BOILERS**

**THE H. B. SMITH CO., INC., 63 Main Street, Westfield, Mass. Offices and Representatives in Principal Cities**

# Degree-Days for January, 1948 (Concluded)

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

| City | January | | | Cumulative, Sept. 1, 1947 to Jan. 31, 1948 | | | Heating Season[1] |
|---|---|---|---|---|---|---|---|
| | 1948 | 1947 | Normal | 1948 | 1947 | Normal | Normal |
| Lansing, Michigan | 1499 | 1189 | 1336 | 4015 | 3391 | 4001 | 7048 |
| Lewiston, Maine | 1534 | 1427 | 1452 | 4224 | 4090 | 4289 | 7707 |
| Lincoln, Nebraska | 1332 | 1087 | 1311 | 3528 | 3153 | 3512 | 5999 |
| Little Rock, Arkansas | 929 | 658 | 719 | 2066 | 1603 | 1798 | 2811 |
| Livingston, Montana | 1176 | 1257 | 1220 | 4028 | 4373 | 3951 | 7245** |
| Los Angeles, California | 219 | 285 | 326 | 676 | 816 | 1016 | 1504 |
| Louisville, Kentucky | 1181 | 780 | 939 | 2750 | 2075 | 2526 | 4180 |
| Lynchburg, Virginia | 1042 | 720 | 856 | 2727 | 2026 | 2413 | 3980 |
| Macon, Georgia | 709 | 448 | 549 | 1670 | 1141 | 1446 | 2201 |
| Madison, Wisconsin | 1604 | 1299 | 1500 | 4291 | 3727 | 4258 | 7429 |
| Marquette, Michigan | 1579 | 1366 | 1500 | 4488 | 4291 | 4554 | 8693* |
| Memphis, Tennessee | 1015 | 664 | 744 | 2180 | 1590 | 1871 | 2950 |
| Meridian, Mississippi | 794 | 477 | 552 | 1645 | 1172 | 1435 | 2160 |
| Milwaukee, Wisconsin | 1546 | 1220 | 1383 | 4047 | 3615 | 3984 | 7245 |
| Minneapolis, Minnesota | 1697 | 1348 | 1609 | 4728 | 4314 | 4550 | 7850 |
| Modena, Utah | 1104 | 1260 | 1187 | 3934 | 3920 | 3859 | 6562 |
| Montgomery, Alabama | 717 | 392 | 515 | 1472 | 932 | 1284 | 1884 |
| Nantucket, Massachusetts | 1154 | 920 | 1026 | 3224 | 2618 | 2938 | 5957 |
| Nashville, Tennessee | 1101 | 686 | 812 | 2439 | 1757 | 2175 | 3507 |
| New Haven, Connecticut | 1306 | 1001 | 1110 | 3463 | 2802 | 3219 | 5895 |
| New Orleans, Louisiana | 542 | 300 | 332 | 1018 | 575 | 735 | 1024 |
| New York, New York | 1211 | 865 | 1028 | 3015 | 2307 | 2884 | 5274*** |
| Nome, Alaska† | 1775 | 2046 | 1857 | 5192 | 5267 | 5236 | 14580** |
| Norfolk, Virginia | 895 | 497 | 738 | 2041 | 1318 | 1933 | 3350 |
| North Head, Washington | 661 | 776 | 725 | 2320 | 2710 | 2510 | 5452** |
| North Platte, Nebraska | 1185 | 1078 | 1300 | 3549 | 3537 | 3786 | 6366 |
| Oakland, California | 438 | 644 | 527 | 1584 | 1851 | 1626 | 3143** |
| Oklahoma City, Oklahoma | 1007 | 820 | 865 | 2309 | 1970 | 2244 | 3613 |
| Omaha, Nebraska | 1393 | 1127 | 1355 | 3654 | 3268 | 3639 | 6131 |
| Oswego, New York | 1420 | 1158 | 1277 | 3787 | 3235 | 3771 | 7088 |
| Parkersburg, West Virginia | 1257 | 787 | 992 | 3031 | 2226 | 2822 | 4775 |
| Peoria, Illinois | 1390 | 1133 | 1283 | 3558 | 3078 | 3606 | 6109 |
| Philadelphia, Pennsylvania | 1169 | 781 | 962 | 2857 | 2100 | 2661 | 4737*** |
| Phoenix, Arizona | 357 | 449 | 409 | 1055 | 1033 | 990 | 1405 |
| Pittsburgh, Pennsylvania | 1343 | 892 | 1054 | 3378 | 2564 | 3003 | 5235 |
| Pocatello, Idaho | 1197 | 1439 | 1218 | 3959 | 4191 | 3867 | 6655 |
| Portland, Maine | 1531 | 1349 | 1321 | 4083 | 3853 | 3926 | 7218 |
| Portland, Oregon | 725 | 803 | 806 | 2187 | 2552 | 2530 | 4469 |
| Providence, Rhode Island | 1260 | 983 | 1116 | 3302 | 2676 | 3246 | 6015 |
| Pueblo, Colorado | 1168 | 1103 | 1060 | 3400 | 3409 | 3224 | 5514 |
| Raleigh, North Carolina | 911 | 533 | 722 | 2223 | 1471 | 1975 | 3234 |
| Rapid City, South Dakota | 1226 | 1161 | 1320 | 3883 | 4140 | 4021 | 7118 |
| Reading, Pennsylvania | 1250 | 860 | 1088 | 3114 | 2422 | 3102 | 5389 |
| Red Bluff, California | 454 | 682 | (a) | 1597 | 1803 | (a) | (a) |
| Reno, Nevada | 902 | 1041 | 1042 | 3347 | 3547 | 3326 | 5892 |
| Richmond, Virginia | 1012 | 614 | 831 | 2505 | 1714 | 2211 | 3695 |
| Rochester, New York | 1442 | 1109 | 1252 | 3832 | 3193 | 3666 | 6732 |
| Roseburg, Oregon | (a) | 804 | 744 | (a) | 2694 | 2485 | 4428 |
| Roswell, New Mexico | 972 | 819 | 786 | 2517 | 2125 | 2296 | 3484 |
| Sacramento, California | 468 | 699 | 614 | 1600 | 1854 | 1610 | 2653 |
| St. Joseph, Missouri | 1302 | 1037 | 1187 | 3226 | 2769 | 3147 | 5161 |
| St. Louis, Missouri | 1187 | 854 | 1060 | 2833 | 2217 | 2798 | 4585 |
| Salt Lake City, Utah | 1084 | 1330 | 1110 | 3453 | 3755 | 3259 | 5555 |
| San Antonio, Texas | 604 | 516 | 381 | 1233 | 1025 | 854 | 1202 |
| San Diego, California | 297 | 358 | 332 | 790 | 865 | 819 | 1645 |
| Sandusky, Ohio | 1351 | 992 | 1181 | 3425 | 2735 | 3323 | 6208 |
| San Francisco, California | 312 | 556 | 465 | 1285 | 1578 | 1414 | 3264** |
| Sault Ste. Marie, Michigan | 1716 | 1478 | 1581 | 4803 | 4601 | 4828 | 9285** |
| Savannah, Georgia | 584 | 235 | 409 | 1227 | 649 | 1007 | 1490 |
| Scranton, Pennsylvania | 1398 | 991 | 1172 | 3642 | 2896 | 3446 | 6129 |
| Seattle, Washington | 731 | 813 | 781 | 2370 | 2728 | 2650 | 4934** |
| Sheridan, Wyoming | 1232 | 1227 | 1431 | 4119 | 4313 | 4629 | 8008 |
| Shreveport, Louisiana | 804 | 556 | 555 | 1646 | 1192 | 1324 | 1938 |
| Sioux City, Iowa | 1463 | 1247 | 1435 | 4090 | 3888 | 4018 | 6898 |
| Spokane, Washington | 1162 | 1262 | 1172 | 3764 | 4027 | 3755 | 6355 |
| Springfield, Illinois | 1255 | 980 | 1181 | 3128 | 2667 | 3183 | 5373 |
| Springfield, Missouri | 1185 | 909 | 973 | 2808 | 2398 | 2647 | 4428 |
| Syracuse, New York | 1470 | 1157 | 1277 | 3947 | 3285 | 3768 | 6893 |
| Tacoma, Washington | 794 | 851 | 812 | 2595 | 2946 | 2763 | 5181** |
| Terre Haute, Indiana | 1333 | 918 | 1070 | 3352 | 2474 | 2910 | 4872 |
| Toledo, Ohio | 1428 | 1076 | 1203 | 3745 | 3072 | 3392 | 6077 |
| Topeka, Kansas | 1224 | 993 | 1135 | 3012 | 2650 | 3018 | 4969 |
| Trenton, New Jersey | 1225 | 833 | 1014 | 3093 | 2328 | 2774 | 4933 |
| Utica, New York | 1525 | 823 | 1248 | 4113 | 2814 | 3785 | 6796 |
| Valentine, Nebraska | 1320 | 1204 | 1370 | 3975 | 3997 | 4095 | 7039 |
| Walla Walla, Washington | (a) | 1015 | 989 | (a) | 3123 | 2898 | 4808 |
| Washington, D. C. | 1110 | 708 | 970 | 2727 | 1958 | 2711 | 4626 |
| Wichita, Kansas | 1148 | 960 | 1094 | 2825 | 2543 | 2877 | 4673 |
| Williston, North Dakota | 1550 | 1441 | 1805 | 4898 | 5186 | 5463 | 9323 |
| Winnemucca, Nevada | 949 | 1223 | 1150 | 3546 | 3848 | 3739 | 6427** |
| Yakima, Washington | 1049 | 1154 | 1159 | 3291 | 3787 | 3587 | 5599 |

(a) Data not available.
†None data are for December.
*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.
[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

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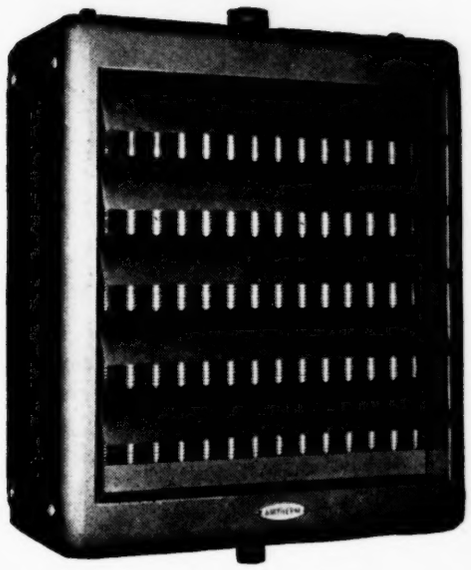
# AIRTHERM
## STEAM UNIT HEATERS
FOR OUTSTANDING PERFORMANCE



1. High over-all efficiency.
2. Attractive in design and rugged in construction.
3. Copper heating elements in floating suspension.
4. Resiliently mounted motors for smooth and quiet operation.
5. Capacities from 26,000 to 274,000 BTU per hour.

There's an Airtherm Steam Unit Heater for every heating application. Write for Bulletin 1206 giving detailed information and range of available sizes.

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DIRECT FIRED HEATERS | PROPELLER FAN STEAM UNIT HEATERS | BLOWER FAN STEAM UNIT HEATERS | CONVECTOR RADIATION

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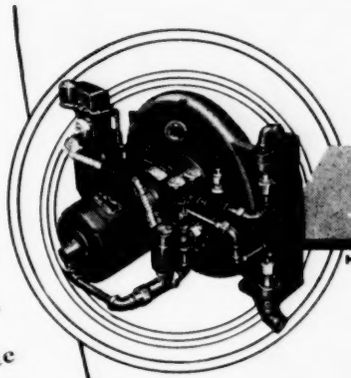
OUR increased production facilities and personnel enable us to satisfy the requirements of a few additional competent organizations capable of selling, engineering, installing, and servicing our complete line of industrial horizontal rotary oil burners.

You are invited to investigate the unusual sales and merchandising advantages of the Ace Uniflow Oil Burner.

A profitable opportunity awaits the right organizations.



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UNIFLOW
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# OIL BURNERS
FOR PERFECT HEAVY OIL BURNING UNDER ALL OPERATING CONDITIONS

*Models Available*

| | GALLONS PER HOUR | BOILER H. P. | SQUARE FEET STEAM RAD |
|---|---|---|---|
| MINIMUM | 2 | 6 | 800 |
| MAXIMUM | 165 | 500 | 64,000 |

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# NEW CATALOGS

### Allowable Working Pressures

A new and enlarged edition of the booklet, "Allowable Working Pressures," designed as a reference source, gives allowable working pressures for Tube-Turn welding fittings in five classes of piping. The tables are based upon the ASME and ASA boiler construction and pressure piping codes. The booklet deals with piping gas, air and oil and district heating piping. Also covered are plant process piping, and hydraulic machinery piping, which are not included in the ASA code for pressure piping.—*Tube Turns, Inc., 224 East Broadway, Louisville 1, Ky.* .....34

### Direct Fired Heaters

The Airtherm line of direct fired space heaters is described and illustrated in an 18-page, 3-color catalog. Gas or oil fired floor models, horizontal and inverted suspension models with control panels, convectors, burners, and accessories are offered with capacity tables, dimensions, and installation diagrams.—*Airtherm Manufacturing Co., St. Louis, Mo.* .....35

### District Heating

A new addition to a series of case histories on central heating covers the district heating system supplying Pittsburgh institutions, especially those comprising the Civic Center including Carnegie Institute, the Cathedral of Learning, Mellon Institute, and others. Photographs and maps illustrate the 12-page booklet. —*The Ric-wiL Co., Cleveland 14, Ohio.* .....36

### Die-Less Duplicating

A new edition of the 40-page Di-Acro catalog contains illustrations and specifications of all Di-Acro precision machines which are now available in six different types and a total of eighteen different sizes for the shaping of sheet, wire, and tube metal parts. New machines have greatly increased the scope of Die-Less Duplicating.—*O'Neil-Irwin Mfg. Co., Lake City, Minn.* .....37

### Hot Water Heat

A 16-page, 3-color, consumer booklet covers the Thrush controlled hot water heating system with forced circulating flow control. Flow control valves, water circulators, thermostatic controls, tanks and heat transfer accessories are described in this booklet. —*H. A. Thrush & Co., Peru, Ind.* .....38

### Traveling Grate Stoker

A traveling grate anthracite stoker for the boiler size range 25 to 250 hp is described in a 4-page bulletin with photographs and installation diagrams.—*Coxe Stoker Engineering Co., Hazelton, Pa.* .....39

### Electric Motors

The Permamotor line of electric motors is described and illustrated in a 3-color booklet showing cutaway views, windings, shaft assembly, frame, and manufacturing techniques.—*A. O. Smith Electrical Manufacturing Co., Los Angeles 14, Calif.* .....40

### Hot Water Equipment

Catalog No. 17 describes the General line of indirect water heaters, tankless heaters, mixing valves, tank heating units, pipe unions, etc. Rating and sizing tables are included. — *General Fittings Co., 123 Georgia Ave., Providence 5, R. I.* .....41

### Self-Priming Pump

An automatic self-priming pump is described and illustrated with photographs, drawings and cross-section illustrations in an 8-page, 2-color folder. A diagram shows how liquid from a priming chamber is recirculated through the impeller until the pump is primed. A range diagram shows capacities to 550 gpm and working pressures to 250 ft of head.—*Allis-Chalmers, Milwaukee 1, Wis.* .....42

### Mechanical Rubber Products

Described in a catalog "*Manhattan Rubber Products for Industry*," are many mechanical rubber products and special items. Particular emphasis is given transmission and conveyor belting, V-belts, hose, engineered molded products, rubber roll coverings, tank linings, and abrasive wheels. — *Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J.* .....43

### Heliarc Welding

An instruction booklet "How to Weld with the Heliarc Torch" offers basic instructions for welding aluminum, magnesium, and stainless steel with an inert-gas-shielded arc. This is a supplementary booklet in combination with a catalog of Heliarc welding equipment defining and illustrating the process and providing technical data for the welding of metals.—*Linde Air Products Co., 30 E. 42 St., New York 17, N. Y.*...44

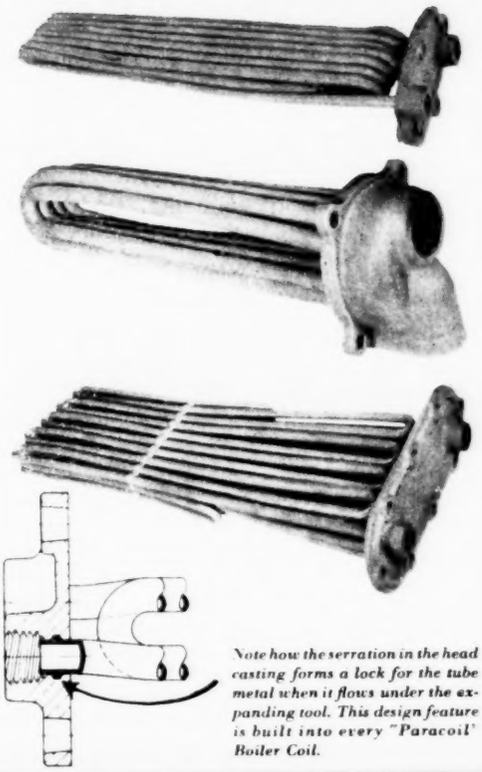
### Gas Vent and Flue Pipe

A new Metalbestos gas vent and flue pipe catalog describes the problems of gas appliance venting and points out the advantages of Metalbestos patented pipe-within-a-pipe construction. Photographs and cut-away drawings show the construction details of the pipe which is manufactured in both round and oval shapes in 3-ft, 5-ft, and 10-ft lengths. The complete line of fittings is pictured and described. Specifications, dimensions and weights of the pipe and fittings are included, along with instructions and suggestions for installers.—*Williams-Wallace Co., Dept. B, 168 Hooper St., San Francisco 7, Cal.* .....45

# Paracoil Submerged Boiler Coils

★ ★ ★ ★ ★ ★ ★ ★ ★ ★

## for HOME and INDUSTRY





*Note how the serration in the head casting forms a lock for the tube metal when it flows under the expanding tool. This design feature is built into every "Paracoil" Boiler Coil.*

"Paracoil" has been building dependable boiler coils since 1915 for both home and industry. Here are a few of the varied types of instantaneous tankless water coils we are now fabricating for domestic residence boilers.

All head castings have SERRATED TUBE CONNECTIONS—another "Paracoil" design feature! You are doubly protected against leaks with a "Paracoil" Boiler Coil!

"Paracoil" Boiler Coils are designed for use with or without a storage tank. The larger industrial models are built with integrally cast water chambers and tube sheets to any desired capacity.

*"Paracoil" manufactures many types of heating and ventilating accessories—all distributed through franchised agents. Some lucrative territories are still available. If interested, write our Elizabeth office for details.*

**DAVIS ENGINEERING CORPORATION**

**1058 EAST GRAND STREET**
**ELIZABETH 4, NEW JERSEY**

**30 ROCKEFELLER PLAZA**
**NEW YORK 20, N. Y.**

***BUY OR SPECIFY "PARACOIL"***

---

# Positive Performance

## MECHANICAL DRAFT TOWERS

### For Air-Conditioning and Refrigeration

Predetermined performance for any installation is just one feature . . . but a very important one . . . of Marley mechanical draft towers for small and medium capacity services. The careful capacity rating of these towers is the result of Marley engineering and experience and constant testing in the Marley factory—*not on your job.*

Built for long, trouble-free service life and *fitted to the job,* Marley towers are specified with complete confidence by engineers throughout the Americas.

- **SMALL SERIES VERTICAL**—**Versatile medium capacity tower, may be steel or wood cased, spray or wood filled. Conforms to building codes and harmonizes with architectural design.**
- **AQUATOWER**—**For indoor or outdoor applications, is shipped completely assembled and put in service by making a few simple connections. The case is steel; filling is long-lasting redwood.**

***MARLEY WAY is the PERFECT SPRAY***

For spraying water, milk, oil, acid, DDT, 2-4D and other fluids Marley Non-Clog Spray Nozzles are first choice of equipment makers and users.

**MARLEY COOLING TOWERS**

**THE MARLEY COMPANY, INC. • KANSAS CITY 15, KANSAS**

### Boiler Blow-Down Separator

A new bulletin deals with boiler blow-down disposal problems and describes the Wilson centrifugal blow-down separator. It includes discussion and recommendations on boiler blow-down piping arrangements and separator installation dimensions for small and medium size boiler plants who have the problem of disposing of boiler blow-down sludge and water and are not permitted to discharge it directly to a sewer without first arranging for venting of flash steam.—*Wilson Engineering Corp., Dept. H. & V., 122 S. Michigan Ave., Chicago, Ill.* .....46

### Data Book Supplement

The Tube-Turn Catalog and Engineering Data Book No. 111, on the subject of welding fittings and flanges for industrial piping, now has a 20-page supplement devoted to specifications that cover new items in the continually expanding line of Tube-Turn fittings. It is 6 x 9 in. and slips easily into the pocket on the inside back cover of No. 111.—*Tube Turns, Inc., 224 East Broadway, Louisville 1, Ky.* .....47

### Instruments

A 66-page, illustrated catalog covers standard makes of instruments and controls. This catalog gives complete data, specifications, and prices on a great variety of instruments useful to manufacturers and industry in general. Suggestions on the purchase and use of instruments, together with charts illustrating conventional instrument connections are presented. The sections in this book include: Various makes of pyrometers, pyrometric controllers, recorders, thermocouples, portable, panel and switchboard meters, electronic meters and electrical service instruments, variable and constant voltage transformers, power transformers, rectifiers, rheostats, relays, counters, and other equipment. — *Electro-Tech Equipment Co., 117 Lafayette St., New York 13, N. Y.* .....48

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MARCH, 1948

**TO OBTAIN COPIES OF TRADE LITERATURE listed in this issue, circle on the list below the publication wanted, using the item number at the end of each review.**

Print your name and address, mail to
Editor, HEATING AND VENTILATING,
148 Lafayette Street, New York 13, N. Y.

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| 41 | 42 | 43 | 44 | 45 | 46 | 47 |
| 48 | 49 | 50 | 51 | 52 | | |

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### Wellway Fire Protection

A 16-page illustrated booklet, "The Exhaust-Water Spray Fire Protective System for Wellways," which describes in detail this new method of combating the spread of fire and fumes through burning buildings, has been published jointly by Otis Elevator Co., Westinghouse Electric Corp. and Grinnell Co., Inc.

In view of the special problem of protecting against fire in moving stairways, the three companies developed and thoroughly tested the exhaust-water spray system. The booklet describes in detail preparation for and method of conducting the experiments, their results, and the application and operation of the system in multi-story buildings. The three sponsoring companies have completed designs for application of the system to several moving stairway installations and are prepared to consult with architects, engineers, builders and owners on the application of the system to specific installations.—*Otis Elevator Co., 260 Eleventh Ave., New York 1, N. Y.* .....49

### Moisture Measuring Equipment

A new 28-page bulletin (No. 2164-93) gives a description of a complete line of electric hygrometer equipment suitable for the more exacting industrial and laboratory applications. The booklet lists among many other devices, a tiny sensing element that responds within a fraction of a second to increases or decreases of relative humidity as small as 0.1%. This new bulletin includes data on various industrial and laboratory applications, as well as helpful selection charts, diagrams, and calibration curves.—*American Instrument Co., Inc., Silver Springs, Md.* .....50

### Refrigeration Valves

A new 20-page condensed catalog, describing the entire line of AP refrigeration valves, includes 35 photos and drawings illustrating expansion valves, water and pressure regulating valves, the new Model 234 refrigerant check valve, solenoids, AP Trapdri's and Trapit's. Engineering specifications for each valve are included.—*Automatic Products Co., Milwaukee 10, Wis.* .....51

### Thermostats and Engineering Service

Thermostats providing a wide range of selectivity for manufacturers of electrical appliances and heating units are described, along with the company's heat and control engineering service, in a new series of leaflets. The first leaflet (B-3954) explains how the "therm-a-neering" service provides thermal and electrical engineers and a well-equipped development laboratory to assist the manufacturer in handling problems of heat and its application. The second (B-3939) describes and discusses the advantage of three of the Westinghouse line of thermostats, the Uni-Therm, Sentinel, and Guardsman. The third (B-3938) describes the Clostemp thermostat designed for storage type, domestic water heaters. Complete diagrams and photographs are included in all the leaflets.—*Westinghouse Electric Corp., Meadville, Pa.*.....52

One of a series *of messages to help you increase your understanding of business paper advertising, and its effect on your business.*

# How much longer can your company afford to "refuse business tactfully"?

LET'S FACE IT — the honeymoon is about over. It was fun while it lasted, but it won't pay the rent. Not now.

After an absence of seven years, the spectre of a buyers' market is once more rearing its head, and its expression plainly reads—"I'm going to be hard to get."

This doesn't scare anybody who hasn't forgotten *how to sell.* But there are quite a few of us in American business who could use a quick refresher course. (We've had a long "vacation.")

When it comes to production, our output is up almost 100 per cent. We've acquired a lot of new techniques on the assembly line, because it was obvious that if there were to be any profits left—after increased labor costs, high-priced materials, and taxes—we'd have to trim every last ounce of fat off the manufacturing cost per unit.

But now the time has come when we must apply the same philosophy to the *manufacture of a sale.* That means—*more mechanization!*

Confronted with a buyers' market, how much will it cost *your* company to produce one unit of sale? A prohibitive sum, if you're going to depend entirely on personal contact. You'd have to hire a tremendous force of salesmen to cover the field. Even then, much of their valuable time would be spent on "missionary work"—which is really a job for *mechanized selling.*

Mechanized selling is simply another name for consistent and aggressive advertising. Like the machine on the production line, it is a multiplier of men's efforts, for it enables them to produce (*and earn*) far more than they could alone.

And when it goes to work in the business press, it becomes the most efficient machine at your disposal for *manufacturing sales at a profit!*

*Just how efficiently does business paper advertising work? If you'd like to see some examples, we'll be glad to send you a recent ABP folder on actual results. Also, if you'd like reprints of this advertisement (or the entire series) to show to others in your organization, you may have them for the asking.*

**HEATING AND VENTILATING**

*is one of the 129 members of The Associated Business Papers, whose chief purpose is to maintain the highest standards of editorial helpfulness—for the benefit of reader and advertiser alike.*

Self-Contained Inner Unit

Air Volume Adjustment

FAST INSTALLATION

*"Custom-made" air pattern with Kno-Draft Adjustable Diffusers in Champion Spark Plug Plant*

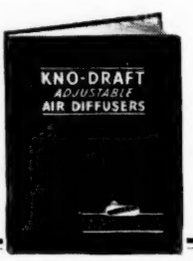
**PROBLEM:** A ceramic kiln radiates heat on one side and a cold window-filled wall creates drafts on the other. The space is long and narrow with low head room. The occupants work in short sleeves. Unusually large volumes of supply air have to be brought in to combat the heat of the kiln. Space for duct work above the room is limited so that diffusers have to be spaced much closer than usual. The supply air stream has to be directed slightly above the horizontal and evenly distributed so that no drafts are felt by the personnel.

**SOLUTION:** Kno-Draft Adjustable Air Diffusers were chosen because of their ability to control air direction, volume and throw. A "custom-made" air pattern was created which thoroughly mixed room and supply air, maintained uniform temperature throughout and eliminated drafts, hot spots, and cold spots. *Installation* was fast. Kno-Draft self-contained inner units cut installation time up to 50%. *Balancing* was fast. CFM readings were taken directly with Velometer. A twist of the wrist changes air volume on each diffuser.

**Free** — **New handbook on Air Diffusion**

It contains the latest engineering data on air diffusion and is profusely illustrated with charts, photographs, sketches and dimension prints that simplify the selection, application, location, assembly, erection, testing and adjusting of Kno-Draft Adjustable Air Diffusers. It is designed to help you get top efficiency from an air conditioning system by creating "custom-made" air distribution patterns.

For your FREE copy, please write Dept. E-10.




**W. B. CONNOR ENGINEERING CORP.**

*Air Diffusion • Air Purification • Air Recovery*

**112 East 32nd Street** — WB CONNOR ENGINEERING CORP. — **New York 16, N. Y.**

**IN CANADA:** Douglas Engineering Co., Ltd., 190 Murray Street, Montreal 3, P. Q.


# WHAT READERS SAY

## Concentration of Air Contaminants

EDITOR, HEATING AND VENTILATING

I have noted in the H & V Reference Data Sheet No. 355, appearing in the December issue of HEATING AND VENTILATING, information as to the maximum allowable concentrations of air contaminants and would like to bring out certain details that appear to be incorrect.

Ammonia actually has the same toxicity as methyl bromide as shown by the Underwriters' Laboratories Report MH-2375. However, ammonia gives definite warning of its presence owing to its very sharp odor.

Carbon tetrachloride is no more toxic than methyl formate or chloroform as shown in Underwriters' Laboratories Report MH-2375.

In the tabulation referred to carbon dioxide is shown as less toxic than Freon-11, Freon-22, Freon-12 and Freon-114 which is not correct as disclosed by Underwriters' Laboratories Report MH-2375 and other authoritative data.

Freon-11, Freon-21, Freon-12 and Freon-114 are shown in the tabulation referred to as of the same toxicity as ethyl chloride which again is incorrect as disclosed in MH-2375. Ethyl chloride is an anesthetic and while it gives some warning of its presence a person might tolerate exposures to it in dangerous concentrations until helpless. Furthermore, ethyl chloride is moderately flammable and, although, it is less hazardous than gasoline it is more hazardous than ammonia.

A tabulation is given of various gases and vapors, some of which have been used as refrigerants, with such data comparing that in HEATING AND VENTILATING with that in the various Underwriters' Laboratories Reports.

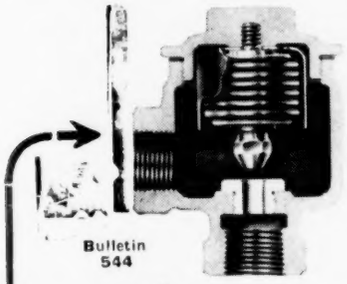
*R. J. Thompson*
*Sales Manager—Technical*
*Kinetic Chemicals, Inc.*

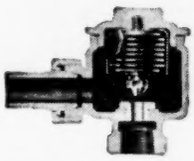
*Wilmington 98, Del.*

| Gases and Vapors | H & V Data Sheet 355 | | Underwriters' Laboratories | | | |
|---|---|---|---|---|---|---|
| | ppm by volume | % by volume | Report number | Group number | % by volume | time |
| | | | | | Lethal | |
| Sulfur dioxide | 10 | .001 | MH2375 | 1 | ½ to 1 | 5 min. |
| Ammonia | 100 | .01 | MH2375 | 2 | ½ to 1 | ½ hr |
| Methyl bromide | 20 | .002 | MH2375 | 2 | ½ to 1 | ½ hr |
| Methylformate | 100 | .01 | MH2375 | 3 | 2 to 2½ | 1 hr |
| Chloroform | 100 | .01 | MH2375 | 3 | 2 to 2½ | 1 hr |
| Carbon tetrachloride | 50 | .005 | MH2375 | 3 | 2 to 2½ | 1 hr |
| Methyl chloride | 100 | .01 | MH2375 | 4 | 2 to 2½ | 2 hr |
| Dichloroethylene | 200 | .02 | MH2375 | 4 | 2 to 2½ | 2 hr |
| Ethyl bromide | 200 | .02 | MH2375 | 4 | 2 to 2½ | 2 hr |
| Ethyl chloride | 1000 | .10 | MH2375 | 4½ | 2 to 2½ | 2 hr |
| Methylene chloride | 500 | .05 | MH2375 | 4½ | 2 to 2½ | 2 hr |
| Freon-21 | 1000 | .10 | MH2630 | 4½ | 10 | ½ hr |
| Freon-113 | | | MH3072 | 4½ | 5 | 2 hr |
| Carbon dioxide | 5000 | .50 | MH2375 | 5a | 30 | 1 hr |
| Freon-11 | 1000 | .10 | MH2375 | 5a | 10 | 2 hr |
| Freon-22 | | | MH3134 | 5a | 10 | 2 hr |
| Freon-12 | 1000 | .10 | MH2375 | 6 | *20 | 2 hr |
| Freon-114 | 1000 | .10 | MH2375 | 6 | *20 | 2 hr |

*Do not appear to produce injury.

# How to Keep Equipment FULL of Live Steam . . .





Prompt and full drainage of condensate and venting of air and noncondensible gases are among the most important factors in maintaining maximum heat in coils, kettles, etc. Two reasons why Nicholson thermostatic traps prove superior in test after test: (1) operate on lowest temperature differential, 5° to 15°, depending on trap size and steam pressure. (2) 2 to 6 times average drainage capacity. We'll gladly send one for testing.

**5 TYPES FOR EVERY APPLICATION**—heat, power, process; size ¼" to 2"; pressure to 225 lbs. Bulletin 544 or see Sweet's.

**W. H. NICHOLSON & CO.,** 199 OREGON STREET WILKES-BARRE, PA.

*Valves ★ Traps ★ Steam Specialties*

BETTER

*Flexible*

METAL HOSE

*FOR EVERY PURPOSE*

• **SEAMLESS**—Constructed from one continuous piece of uniform thickness • **PARALLEL CORRUGATION** assures maximum strength and flexibility • **SPECIAL ALLOYS** provide resistance to heat, acid, etc., depending on requirements • **AVAILABLE** in wide variety of types to convey all kinds of liquids and gases • **AVAILABLE** in complete form as vibration reducers for Air Conditioning and Refrigeration Units.

*Write* Eclipse-Pioneer for information.

**ECLIPSE-PIONEER** *Division of* Bendix AVIATION CORPORATION

TETERBORO, NEW JERSEY

# 7 REASONS WHY BINKS "ROTOJET" SPRAY NOZZLES GIVE YOU BETTER SERVICE

① **Clog-proof:** Rotojet nozzles are designed to be self-cleaning. ② **Better atomization:** The high centrifugal force developed by the flow of liquid through the nozzle breaks up the water into a perfect spray. ③ **The correct size:** Rotojet nozzles are made with orifices from $\frac{1}{16}$ inch to $1\frac{13}{16}$ inches. There is a correct size for your installation. ④ **No moving parts:** There is nothing to get out of order. ⑤ **Longer life:** Extra metal at points of severe wear gives Rotojet nozzles long life. ⑥ **Simplicity of Design:** Rotojet nozzles are highly efficient and easy to install. ⑦ **Satisfaction guaranteed:** Binks guarantees every Rotojet nozzle.

**There is a Rotojet nozzle for every spray job**

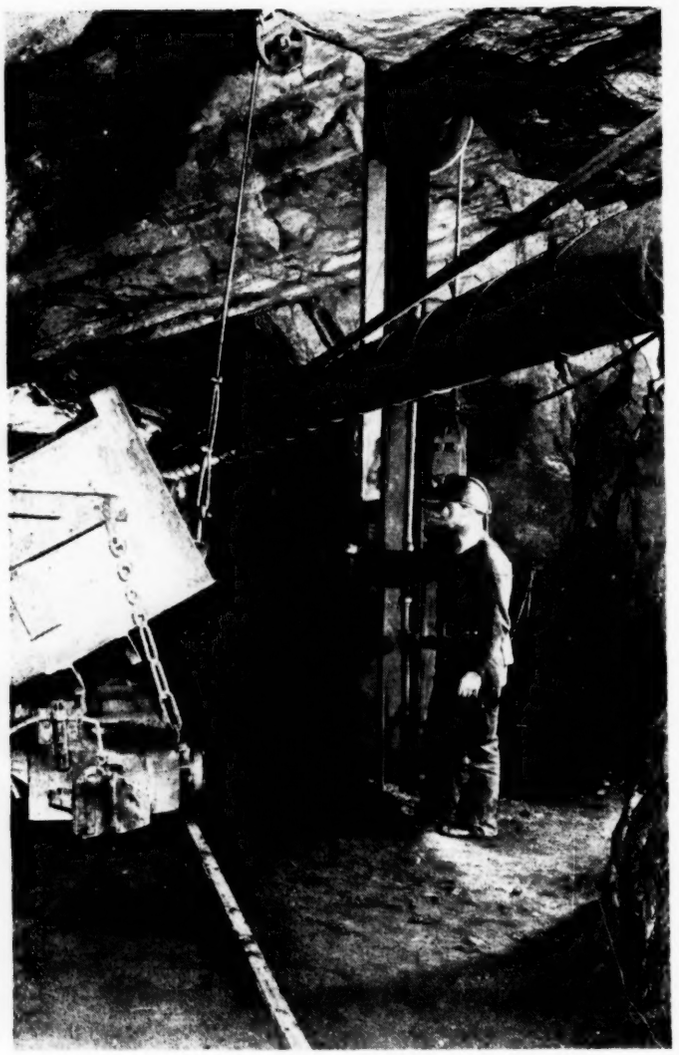
**SEND NOW FOR BULLETIN 450** describing these Rotojet nozzles in full

**Binks** MANUFACTURING COMPANY

3114-40 CARROLL AVE., CHICAGO 12, ILL.

*OFFICES IN ALL PRINCIPAL CITIES*

# It's Naylor Light-Weight Pipe



For push-pull ventilating and for other high or low pressure air service, Naylor is the one light-weight pipe with the built-in strength, leaktightness and safety to meet your requirements. The exclusive Naylor Lockseam Spiralweld provides a reinforcing truss which permits the use of lighter gauge material in the larger diameters without sacrifice of strength. Sizes from 4" to 30" in diameter with all types of fittings, connections and fabrications. Write for Naylor Catalog No. 44.

Naylor

NAYLOR PIPE COMPANY
1269 East 92nd St., Chicago 19, Ill.
New York Office:
230 Madison Av., New York 17, N.Y.


# Getting Personal

In presenting **Richard Irmiter** (*Valves for Heating and Ventilating Work*, page 77), Getting Personal must explain that he is a camera-shy, modest engineer who received his M.E. degree from Northwestern University in 1938. He has been with the Crane Co. for two years. Mr. Irmiter has had considerable experience as technical editor for a number of engineering publications.

*W. C. Pease*

**William C. Pease** (*Progress Report on Heat Transfer Tests of a Buried Copper Pipe*, page 87) received his B.S. in electrical engineering from Alabama Polytechnic Institute in 1936 and an E.E. degree in 1947. He was employed as a test engineer with Duke Power Co. During the war, he served five years in the Army and was separated in 1946 as a Lieutenant Colonel. He was associated with Southern Research Institute for two years as research engineer, and at present is employed with Lummus Cotton Gin Co. as design engineer.

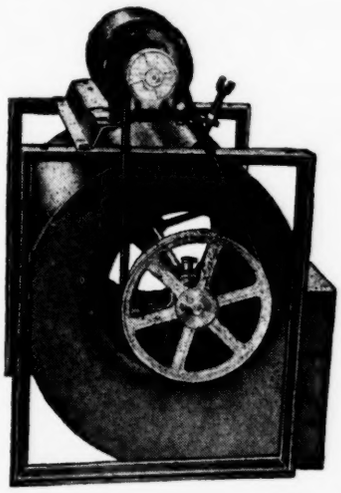
*C. R. Freberg*

**C. R. Freberg** (*Progress Report on Heat Transfer Tests of a Buried Copper Pipe*, page 87), was born in Minnesota and received a Bachelor's and Master's degree in mechanical engineering at the University of Minnesota. This was followed by a Ph.D. from Purdue University in 1943. He taught mechanical engineering at the University of Minnesota and mechanical and aeronautical engineering at the Purdue University for a number of years, as well as doing research at the latter. He was then employed at Carrier Corporation in Syracuse and is now head of the Engineering Division at Southern Research Institute in Birmingham, Ala. He is co-author of two books on vibration and has contributed a number of articles to various magazines.

**Sabert Oglesby** (*Progress Report on Heat Transfer Tests of a Buried Copper Pipe*, page 87) was introduced to readers in the "Getting Personal" column of the November, 1947, issue of HEATING AND VENTILATING.

**R. J. Thompson** (*Concentration of Air Contaminants*, page 142) was recently appointed director of sales, Kinetic Chemicals, Inc., Wilmington, Del. At the time he transmitted the information regarding contaminants he was sales manager, technical.

**R. G. Vanderweil** (*Answers to Questions Frequently Asked Regarding Radiant Heating*, page 101) was formerly project engineer with Chase Brass & Copper Co. He is now associated with the Boston office of Slocum & Fuller, consulting engineers. Mr. Vanderweil has been a member of many panel discussions on radiant heating before various engineering society meetings, and is well versed in the questions commonly asked concerning radiant heating. His biography appears on page 120 of the April, 1945 issue.



THE

# NEW

UNIVERSAL

TYPE "N"

BLOWER

## MASSACHUSETTS . .

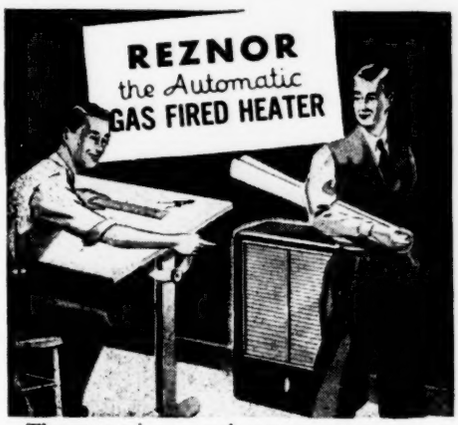
By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION

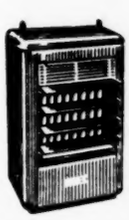
The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE · CLEVELAND 14, OHIO




WITH THE BIG, QUIET FAN

Thermostatic control assures constant temperature and ends costly, troublesome manual effort with extra safety.
Reznor units manufacture heat on the spot...heat isn't wasted enroute from a central unit. No more fires to tend or fuel to store. Save time, space and attention. The "special" heat exchanger also gives you more BTU's of heat per 1000 feet of gas consumed. Write for literature.



REZNOR

Gas fired unit heaters

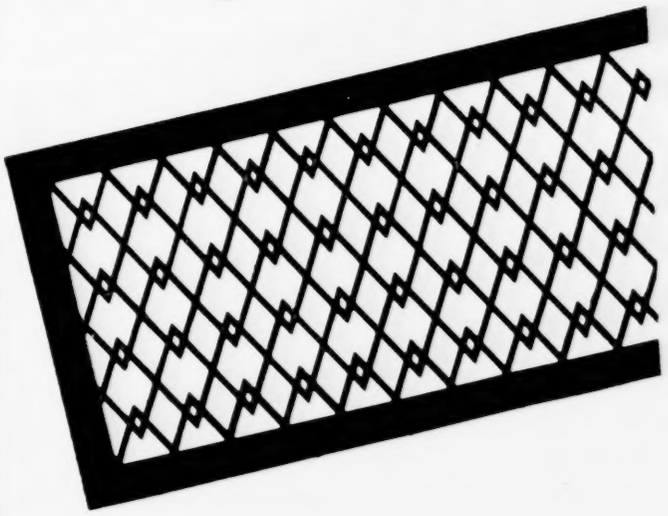
SUSPENDED OR FLOOR MODEL

A SIZE FOR EVERY NEED

REZNOR CO. MERCER 9, PENNA.

GAS FIRED HEATERS SINCE 1888

NO BOILERS • NO STEAM LINES
NO FUEL STORAGE • NO FIRE TENDING



# To harmonize with any decorative motif

there's a choice of over 100 standard Hendrick Grilles

Ornamental grilles are usually the largest and most conspicuous article of hardware in a room. Consequently, their appearance is a prominent factor in the decorative scheme.

To suit any requirements Hendrick Grilles are made in a large variety of attractive and distinctive designs. Each can be supplied in a wide range of overall dimensions, bar sizes, number of perforations and size of perforations. Ample open areas assure good air flow.

Hendrick Grilles are fabricated in accurate sizes, with clean-cut perforations and with no burrs or other imperfections, in heavy-gauge aluminum, bronze, copper, Monel, steel and stainless steel.

They are easy to install, and always lie flat because of a special flattening operation in their manufacture.

The grille illustrated is design M No. 9, which has 67% open area. Write for detailed information.

Sweet's

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids

HENDRICK

Manufacturing Company

42 DUNDAFF STREET, CARBONDALE, PA.

Sales Offices in Principal Cities

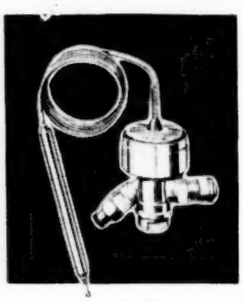
*Recognized Dependability*

# DEPENDABLE...

## *through years of field proving*

Time-tested choice of thousands of manufacturers and engineers, A-P Model 206 is today one of the industry's top favorites for small tonnage units. Factory set at the desired superheat, it is tamper-proof, and no further field adjustments are necessary —a distinct advantage on many systems. You'll find it on large domestic units, water and beverage coolers, display cases, freezers, air conditioners and similar units.

Like all A-P Expansion Valves, the Model 206 maintains a constant superheat over a wide range of evaporator temperatures, less than ½° variation over a range of operating temperatures from minus 30° to 50°F. Popular both as original equipment and as replacement, it is compact, simple to install. Valve body can be mounted in any position or ambient temperature.



**NEW MODEL 211 FIXED SUPERHEAT VALVE WITH LIMITING PRESSURE FEATURE**

Protects systems against motor overload by limiting operating suction pressure to predetermined setting. May be used in place of any standard fixed superheat valve of similar capacity. Capacity, ½ and 1 ton Freon 12, or Methyl. Types available to limit pressures to 15, 40, and 55 lbs. Freon 12; 10 and 30 lbs. Methyl.

AUTOMATIC PRODUCTS COMPANY

2462 North Thirty-Second Street • Milwaukee 10, Wisconsin
*Export Department, 13 East 40th Street, New York 16, N. Y.*

**DEPENDABLE** *Refrigeration Valves*

Stocked and Sold by Good Refrigeration Wholesalers Everywhere
Recommended and Installed by Leading Refrigeration Service Engineers


### INDUSTRIAL DEGREE-DAYS

January, 1948

| City | 55F Base | 45F Base |
|---|---|---|
| Baltimore, Md. | 794 | 485 |
| Buffalo, N. Y. | 1133 | 823 |
| Chicago, Ill. | 1067 | 757 |
| Cleveland, Ohio | 1081 | 771 |
| Detroit, Mich. | 1098 | 788 |
| Indianapolis, Ind. | 995 | 686 |
| New York, N. Y. | 901 | 591 |
| Philadelphia, Pa. | 859 | 549 |
| Pittsburgh, Pa. | 1033 | 725 |
| St. Louis, Mo. | 877 | 578 |

### CANADIAN DEGREE-DAYS FOR JANUARY, 1948*

| City | January 1948 | January Normal | Cumulative, Sept. 1 to Jan. 31 1947-48 | Cumulative, Sept. 1 to Jan. 31 Normal |
|---|---|---|---|---|
| Galgary, Alta. | 1231 | 1609 | 4884 | 5311 |
| Charlottetown, P.E.I. | 1451 | 1463 | 4267 | 4328 |
| Crescent Valley, B. C. | 1296 | 1352 | 4214 | 4631 |
| Edmonton, Alta. | 1407 | 1814 | 5289 | 5798 |
| Fort William, Ont. | 1981 | 1807 | 5715 | 5622 |
| Grande Prairie, Alta. | 1457 | 1841 | 5418 | 6000 |
| Halifax, N. S. | 1276 | 1283 | 3725 | 3898 |
| London, Ont. | 1578 | 1336 | 4224 | 4013 |
| Medicine Hat, Alta. | 1262 | 1643 | 4627 | 5032 |
| Moncton, N. B. | 1562 | 1528 | 4599 | 4429 |
| Montreal, P. Q. | 1682 | 1552 | 4690 | 4648 |
| North Bay, Ont. | 1897 | 1658 | 5342 | 5161 |
| Ottawa, Ont. | 1742 | 1646 | 4850 | 4923 |
| Penticton, B. C. | 1082 | 1184 | 3549 | 3810 |
| Porquis Junction, Ont. | 2058 | 2052 | 5957 | 6300 |
| Prince George, B. C. | 1333 | 1615 | 4842 | 5372 |
| Quebec City, P. Q. | 1705 | 1696 | 4869 | 5207 |
| Regina, Sask. | 1820 | 2037 | 6067 | 6373 |
| St. John, N. B. | 1476 | 1417 | 4218 | 4386 |
| Saskatoon, Sask. | 1795 | 2027 | 6056 | 6276 |
| Toronto, Ont. | 1429 | 1304 | 3815 | 3948 |
| Vancouver, B. C. | 834 | 893 | 2997 | 3061 |
| Victoria, B. C. | 756 | 815 | 2675 | 2725 |
| Windsor, Ont. | 1438 | 1283 | 3754 | 3729 |
| Winnipeg, Man. | 2037 | 2111 | 6123 | 6316 |

*These data are supplied through the courtesy of the Meteorological Division, Air Services Branch, Department of Transport, Canada, with the cooperation of N. W. Etter, Heating Engineer, Enamel & Heating Products Limited, Sackville, N. B.

The Department reports a slight revision in the figure for December for Grande Prairie, Alta., as published in last month's issue. Corrected figure is 1513.

## . . . Since the Last Issue

**J. M. Dalla Valle,** well-known consulting engineer, has been appointed associate professor of chemical engineering at **Georgia School of Technology,** Atlanta, Ga. Dr. Dalla Valle, who specialized over a period of years in work on atmospheric pollution and industrial dust, as well as many related subjects, takes up his teaching duties at Georgia Tech late in March, 1948. He is the author of three books —"Micromeritics," "Exhaust Hoods," and "The Industrial Environment and its Control," as well as numerous articles.

A new sales office supervised by **J. E. Corbett** at 2126 Monroe Ave., Rochester 10, New York, was recently opened by **Penn Electric Switch Co.,** Goshen, Ind. The Rochester office is a division of the company's New York branch. This move was made to give more efficient service to Penn's customers in upper New York state.

**The Engineers' Club of Philadelphia**—junior members—is joining with the Franklin Institute of the State of Pennsylvania in sponsoring a second **Engineering Progress** Show on May 11th to 16th, 1948, inclusive. Exhibits will include many items depicting the progress in engineering. The first show held in the spring of 1947 had an attendance record of over 10,000. The show will be held in Franklin Hall at Franklin Institute. In addition to the exhibits, two nationally prominent engineers will deliver lectures in the Franklin auditorium on two evenings during the week.

**Hoffman Specialty Co.**, Indianapolis, announces the promotion of **E. L. Malm** from assistant sales manager to sales manager of the company, and at the same time has appointed **Wocdrow W. Dillon** as assistant sales manager. Mr. Malm has been in the heating industry since 1922.

*W. W. Dillon*

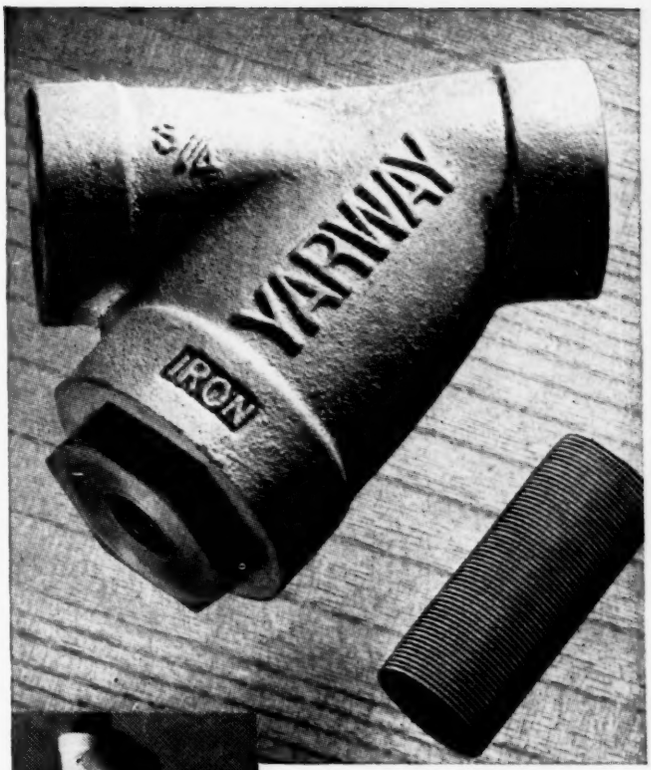
*E. L. Malm*

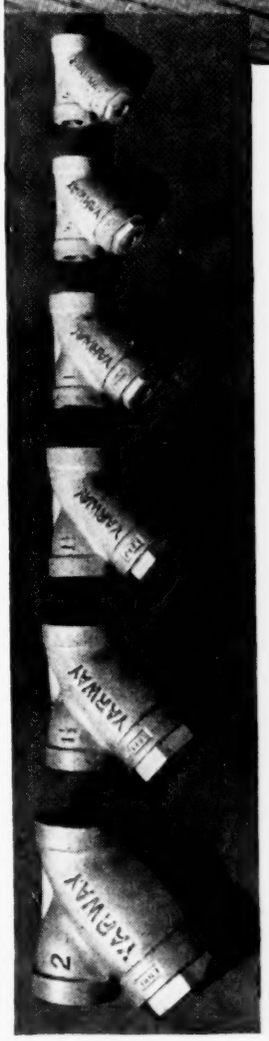
having served with American Radiator Corp., Crane Co. and Bell & Gossett Co. and has been with the Hoffman Specialty Co. since March, 1947. His experience has embraced engineering, territory sales, sales administration and sales promotion. Mr. Dillon has been with Hoffman Specialty Company for 19 years. He will continue to direct advertising and promotional programs.

The **Research Products Corp.** of Madison, Wis., has announced the promotion of **A. W. Brown** to the position of assistant sales manager. The company also announces the addition of **Gilbert H. Piering** to the sales department. Mr. Piering, who recently returned to civilian life after three and one-half years of army service, will cover the territory of Iowa, Missouri, Nebraska, Kansas, Oklahoma, and Arkansas. The Madison firm manufactures air filters, grease filters, expanded fibre products, and water-treating minerals.

**William Juel Hamilton**, secretary and a director of the **Hendrick Manufacturing Co.**, Carbondale, Pa., died January 27 at the age of 80, after a long illness. Mr. Hamilton had been with the Hendrick company 59 years. He was born in Albany, N. Y., December 17, 1867, attended the Albany Boys' Academy, and was graduated in 1889 from Stevens Institute of Technology, Hoboken, with a degree in mechanical engineering, and joined the Hendrick company as an engineer and draftsman. In 1895 he was made purchasing agent, in 1901 he had been secretary of the firm, and since 1910 he had been secretary and a member of the board of directors.

**The Pyle-National Co.** announces the appointment of Thomas J. Little as eastern sales manager, effective January 15, with offices in Grand Central Terminal, New York City. Since 1925, Mr. Little has been a member of the sales organization of Anaconda Wire & Cable Co., New York, N. Y., as sales engineer, manager of transmission sales and as executive assistant.

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*Combination Oil and Gas Burners*

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**Bernard Lester,** assistant manager, headquarters, Industrial Sales Department, **Westinghouse Electric Corp.,** has retired after 43 years of service with Westinghouse. In addition to his recent position, Mr. Lester has served as commercial engineer, manager of the Small Motor Division, assistant industrial sales manager, manager of the Resale Department, and special representative since joining Westinghouse in 1905. Following his retirement, Mr. Lester opened his own consultation service in the sale and distribution of machinery and equipment for managers of medium-sized and small industrial equipment builders and suppliers. His service will emphasize distribution and sales. His office is at 140 Cedar St., New York 6, N. Y. A graduate of Haverford College, Mr. Lester became a pioneer in the training of industrial salesmen and developed and taught the first formal college course ever given in selling industrial equipment, which was established at the Graduate School of the University of Pittsburgh.

**General Electric** has decentralized the advertising division of its Air Conditioning Department into three units, naming **Frederick H. Keswick** as operating manager, **Ross C. Lindblom** as manager of cooling equipment advertising, and **Arthur Rubicam** as manager of heating equipment advertising. Mr. Keswick came to the Air Conditioning

*F. H. Keswick*

*R. C. Lindblom*

*A. Rubicam*

Department early in 1946 after four years of Army service as an ordnance major. Last year, he was made assistant manager of advertising and sales promotion for the department. After joining G.E. in 1928, Mr. Lindblom was an editor of company publications until he began preparing advertising copy in 1930. He came to the Bloomfield plant in 1937 as an advertising writer, and was placed in charge of cooling advertising last year. Mr. Rubicam, who had twelve years experience as an advertising man and free-lance copy writer in the New York area, joined the advertising division in 1945, and was placed in charge of heating advertising two years later.

At the 22nd Annual Meeting of the **Industrial Unit Heater Association** held at New York, N. Y., February 2, the following officers were elected for the ensuing year: **L. D. Mandell,** president; **R. H. Nelson,** vice-president **L. O. Monroe,** secretary-treasurer. Mr. Mandell is assistant manager of C. A. Dunham Co., Chicago, Illinois, and Mr. Nelson is president of The Herman Nelson Corp., Moline, Illinois.

The **Fedders-Quigan Corp.,** manufacturers of automobile radiators, room air conditioning units and commercial refrigeration products, announces the appointment of **John W. Fenyvest** as export manager. Mr. Fenyvest was formerly vice-president of the Pioneer Metal Export Co. of New York City. He has traveled extensively throughout the world and has wide experience with export marketing.

**Warren Webster & Co.**, heating equipment manufacturers, have announced the appointment of **Arthur H. Ross** as representative for the Wilkes-Barre territory, which includes Binghamton, Scranton and Williamsport. Mr. Ross, who takes over the territory handled for the past 30 years by his late father, Frank Ross, is a native of Wilkes-Barre. He graduated from Cornell University in 1932 with a degree in Mechanical Engineering.

It was announced today that **Charles S. Munson**, formerly president of **Air Reduction Co., Inc.**, has been elected chairman of the executive committee. He is succeeded by **John A. Hill**, who becomes the fifth president of the company. **William C. Keeley**, formerly vice-president, was elected chairman of the newly created finance committee. **C. E. Adams** remains chairman of the board of directors.

Formation of **Aminco Refrigeration Products Co.** to take over the refrigeration division of **American Injector Co.** has been announced by E. Kellie and John L. Trix. Mr. Kellie is president of the new organization while Mr. Trix serves as secretary-treasurer. In effect, the refrigeration division of American Injector is now being operated by Aminco Refrigeration Products Co.

The **Timken-Detroit Axle Co.** has acquired the Stoker Division of the **Link-Belt Co.** of Chicago. In making this acquisition, the Timken Silent Automatic Division rounds out its established line of home heating equipment, including the Timken Silent Automatc Wall-Flame oil burner, oil and gas furnaces and boilers, water heaters, and other related products.

The appointment of **Peter G. Holliday** as works manager of **The Pyle-National Co.** of Chicago has been announced. Mr. Holliday was formerly vice-president of Standard Cap and Seal Corp., Chicago.

As a conclusion to the biggest sales year in the 42-year history of **Brunner Mfg. Co.**, their field representatives gathered in Utica for a series of business meetings and inspection trips prior to launching the 1948 sales program. In opening the conference, A. G. Zumbrun, executive director, pointed out that in the past six years manufacturing floor space has been doubled. The company's research department showed the group working models of new developments, yet to be announced. Brunner's growth in foreign trade is evidenced by the fact that over 100 distributors representing foreign countries have visited the factories within the last 12 months.

The appointment of **Dr. Ralph L. Brown**, widely known coal technologist and a pioneer in the development of new products from coal tar chemicals, as chief of the **Bureau of Mines Coal Branch**, Fuels and Explosives Division, has been announced. For the past year, Dr. Brown has been serving as assistant chief of the Coal Branch at the Central Experiment Station in Pittsburgh, Pa. He succeeds Dr. Louis C. McCabe, who resigned from the Bureau last September. In his new position, Dr. Brown will supervise the Bureau's research in the mining, preparation, carbonization, and gasification of coal and related subjects at Bureau experiment stations and pilot plants in various parts of the country. He will be stationed in Washington, D. C. Dr. A. C. Fieldner is chief of the Fuels and Explosives Division, of which the Coal Branch is a part. Dr. Brown was educated at the Missouri State Teachers College (1907-11), University of Missouri (1912-14), and the University of Chicago (1914-17), where he received his Ph.D. in chemistry. He is the author of many scientific and technical papers, and has been granted many United States and foreign patents. Born at Blair, Ill., on July 23, 1890, Dr. Brown is married and has two sons.

Triplex dealers are fortunate. Whether the jobs at hand are conversions in old homes or new home installations, these men can sell *unvarying comfort* that results from *hot water heating at its best!* Here are the reasons why:

The advanced design and precision construction of all Triplex Flow Control Units assure the most efficient, dependable operation possible. Hot water is automatically circulated, abundant heat supplied to radiators instantly . . . whenever and wherever needed. Third floor north is just as comfortable as first floor south, for Triplex Units automatically balance heat loss with heat supply. Ample hot water for domestic use is also provided at practically no additional cost. In other words, the Triplex line enables you to talk and sell in terms of *hot water at its best!*

Learn more about Triplex Flow Control Units and what they can do for you. Write today for latest catalog and price sheet.

Direct Drive Circulators

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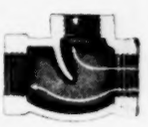
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*Triplex Sump Pumps* (centrifugal closed impeller type) are famous for trouble-free service. Easily installed. Movable float ball permits wide variation in sump depth. Specially tailored motor, with built-in float switch, operates automatically. *Available* in iron and steel or brass models.

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**HEATING SPECIALTY CO., INC.**
**PERU, INDIANA**

In addition to units illustrated, the Triplex line includes — Direct Drive Horizontal Circulators, Indirect Drive Circulators, Relief and Pressure Reducing Valves, Expansion Tanks, Air Eliminators, Water Mixing Valves, Air Vent Valves, Tankless Heaters, Control Units, Electrical Controls, Barometric Draft Dampers.

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The most complete line of Stainless Steel Welding Fittings
PERFECT
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Every P. P. & E. stainless steel welding fitting is permanently identified with Stainless Type number and "stock lot" number. Years after a fitting has been produced, we can quickly refer to the exact analysis of the steel used, and to all other pertinent data. Thus, you are assured that fittings purchased over a period of time will be uniform — in analysis of stainless steel, and in every other specification.
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17 Types of Shutters and Dampers
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"ELGO" TYPE AUTOMATIC SHUTTER
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Auer service on stamped metal grilles saves time and money. A wide variety of designs for all purposes—air conditioning, ventilating, radiator enclosure and concealment. Virtually any sizes, and any practical and workable material. In selecting grilles, you will find Auer Grille Catalog "G" useful. It gives complete grille data, shows all Auer designs, with dimensions, opening sizes, and full scale details. Sent on request. Order Auer Grilles by name and number.
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The appointment of **H. E. Cable** as district manager of the Pittsburgh office has been announced by the **Lincoln Electric Co.** Mr. Cable came to Lincoln Electric in 1943 and has been active since then as a welding engineer in the Pittsburgh area. Mr. Cable graduated from Case School of Applied Science in 1929 with a degree in Mechanical Engineering. The appointment of **J. S. Roscoe** as district manager for the Chicago office has also been announced by the Lincoln Electric Co. Mr. Roscoe comes to Chicago from Pittsburgh where he has been district manager since 1944. He has been active in the past few years in developing the use of welding in the construction of machinery and heavy mill equipment in the Pittsburgh industries. Mr. Roscoe came to the Lincoln Electric Company in 1924 directly from his graduation from Ohio State University.

At the annual meeting of **Chase Brass & Copper Co., Inc., Rodney Chase** was elected vice-president in charge of public and industrial relations. Previously, he had been director of those activities. Rodney Chase began his employment at Chase 28 years ago, in 1920, and was first employed as a machine helper in the rod mill of the old Chase Rolling Mill, later becoming rod promise clerk. A year later, he was transferred to the Chase Metal Works, in Waterville, where he worked in the casting shop scrap room and other production departments of the plant. In 1922, he was made editor of the original company employees' magazine, *Chase Diamond*, and was appointed the first advertising manager of the company. He was later made assistant secretary and in 1941 was given the title of director of public and industrial relations. In this capacity he not only retained control of the advertising policies of the company but also directed the company's labor policies both in Waterbury and in the Chase plants in Cleveland, Ohio.

A traveling sales convention, which will take officers of the company to both coasts of the United States, as far south as Dallas, and as far north as Toronto, Canada, has been announced by **Minneapolis-Honeywell Regulator Co.** The meetings will be addressed by Harold W. Sweatt, president, and all other home office executives including Morton L. Morley, vice-president in charge of sales for the Brown Instrument Division, wholly owned Honeywell subsidiary. Honeywell's field sales organization, which has more than doubled since the war, is to be brought up-to-date on most of the 7,000 different automatic controls the company produces.

The **McNeill Engineering Co.** of Chicago has appointed the **Trimount Instrument Co.**, 37 W. Van Buren Street, Chicago, as its exclusive sales agents to handle its electronic smoke indicators, alarms, recording systems, and high pressure eye-level boiler and tank gages.

A three-day short course for the intensive study of hot water and steam heating systems will be held at the **University of Illinois,** Urbana-Champaign, Ill., June 15, 16, and 17. The course will be sponsored jointly by the University of Illinois and **The Institute of Boiler and Radiator Manufacturers.**

**General Controls Co.**, Glendale, Calif., announces the appointment of **E. B. Maire** as sales manager of the midwestern, southern and eastern branch offices. Mr. Maire has had many years' experience in the automatic control industry and was formerly regional sales manager for General Controls Co.

Appointment of **Gordon M. DeJarlais** as service manager of the Unit Air Conditioner Division of the **Fedders-Quigan Corp.**, Buffalo, N. Y., is announced.

**W. C. Brandau** has been appointed district manager of **Airtherm Manufacturing Co.** in charge of sales and application of Airtherm products in the northern Illinois territory, with headquarters at 1324 West Fulton St., Chicago.

A branch office serving Wichita, Kans., and surrounding territory has been opened by the **Minneapolis-Honeywell Regulator Co.** The manager for the new branch, located at 1514 East Central, Wichita, is **Lynn H. Johnson, Jr.**, who has been sales manager of the company's gas controls division until his latest promotion.

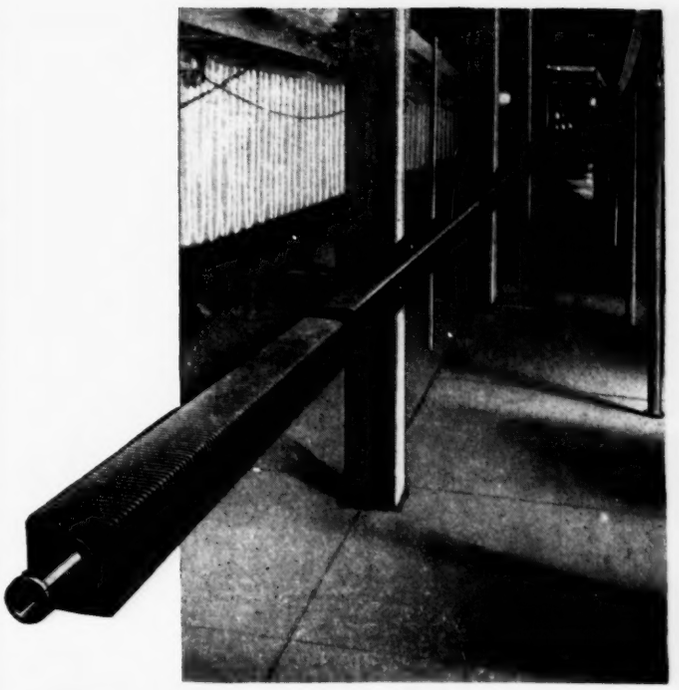
The largest order ever placed for ½ and ¾ horsepower window type room air conditioners (30 carloads) was placed by the D. W. May Company of New York at the **Fedders-Quigan** exhibit in the All Industry Refrigeration and Air Conditioning Exposition in Cleveland.

The **Marlo Coil Co.** of St. Louis announces the appointment of **H. V. Witherspoon** as their factory representative for the eastern half of Maryland including Baltimore and the entire State of Delaware. This new office is located in Room 501, O'Sullivan Building, Baltimore, Md.

**James L. O'Brien, Sr.**, executive general manager of the **Toridheet Division, Cleveland Steel Products Co.**, died unexpectedly, February 7th, in New York City. His sudden demise, at the age of 65, followed a heart attack suffered while with his son-in-law at a restaurant. Mr. O'Brien started his career in oil heating in 1919, with the Hardinge Oil Burner Co., Chicago. Later he opened the NoKol organization, where he remained until 1923. At that time he was appointed general manager of the Silent Automatic Burner Co., Detroit. He took over the Toridheet management in 1932.

As part of its expanded fuels and combustion research, **Battelle Institute,** Columbus, Ohio, has named **Carl E. Miller** to its research advisory staff. Mr. Miller, who was key man in the Army's wartime fuel conservation program, will act as a technical advisor on research in coal, gas, and petroleum technology. Mr. Miller was associated for eight years with the Potomac Electric Power Co., Washington, D. C., and for three years with the Northern Indiana Public Service Co., Michigan City, Indiana. During the war, he served with the War Department in the Office of the Chief of Engineers as chief of the heating section and assistant chief of the utilities branch. In these capacities he was largely responsible for the formulation and execution of the Army's fuel conservation program. The new Battelle appointee is a graduate in electrical engineering from the University of Cincinnati and has studied additionally at Northwestern University. Active in professional groups, he is a member of Tau Beta Pi, honorary engineering society; Eta Kappa Nu, honorary society in electrical engineering; and the ASME.

**C. L. Fay** has been named engineer of **General Electric's** technical services engineering division of the Air Conditioning Dpartment, W. E. Johnson, manager of engineering for the G. E. department, has announced. A graduate of Rensselaer Polytechnic Institute, Mr. Fay was formerly associated with Bell Aircraft Corp. in Buffalo, N. Y., where he served as assistant to the vice-president in charge of engineering. Prior to that post, he was a research engineer in the research division of United Aircraft at East Hartford, Conn. **E. W. Roessler** has been appointed to the staff of General Electric's manager of engineering to undertake special technical assignments for the Air Conditioning Department. Mr. Roessler came to G. E. in 1928 as a test student and was one of the first engineers assigned to the Air Conditioning Department when it came to Bloomfield in 1935. In 1947 he was named engineer of the newly established Technical Services Engineering Division, a post he held until his present assignment.

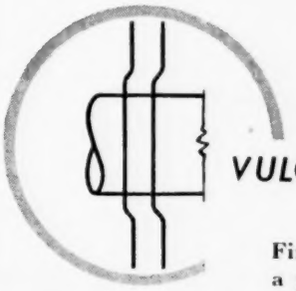



*Flexible* **in application**

**RUGGED** ***in design***

It's simple as installing a length of pipe. Whatever the job specifications, whether high, low, in hard-to-get-at places; in trains, ships, hospitals, schools, public buildings, homes and in industry, Vulcan's flexibility of application cuts installation time . . . makes the job *easier, quicker.*

It's rugged . . . Vulcan's patented offset fins mechanically imbedded in seamless pressure tube give long-life rigidity and dependability . . . yet it is light in weight (one lineal foot, 1¼" steel radiation, weighs but 4.5 lbs.). Radiation comes cut to length, ends threaded or chamfered . . . requires few fittings.



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***VULCAN has the offset fin construction.***

**Fins off-set for rigidity . . . a patented Vulcan feature.**

**THE VULCAN RADIATOR COMPANY**

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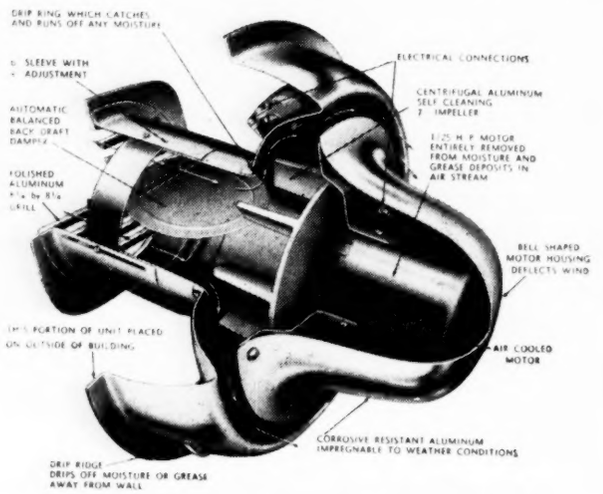
**THE KITCHEN VENTILATING FAN THAT'S DIFFERENT—THE *Kitchen-Aire!***


DRIP RING WHICH CATCHES AND RUNS OFF ANY MOISTURE
ELECTRICAL CONNECTIONS
CENTRIFUGAL ALUMINUM SELF CLEANING IMPELLER
1/25 H.P. MOTOR ENTIRELY REMOVED FROM MOISTURE AND GREASE DEPOSITS IN AIR STREAM
AUTOMATIC BALANCED BACK DRAFT DAMPER
POLISHED ALUMINUM GRILL
BELL SHAPED MOTOR HOUSING DEFLECTS WIND
AIR COOLED MOTOR
CORROSIVE RESISTANT ALUMINUM IMPREGNABLE TO WEATHER CONDITIONS
DRIP RIDGE DRIPS OFF MOISTURE OR GREASE AWAY FROM WALL

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- Equipped with CENTRIFUGAL TYPE HEAVY DUTY ALUMINUM IMPELLER.
- Motor is out of air stream—insuring cleanliness.
- Operating unit located exterior building—fully protected in rustproof non-corrosive attractive aluminum housing against all weather conditions.
- Adaptable to a wide diversity of locations—either ceiling or wall.
- Simple inexpensive wall or ceiling installations. Standard 6" duct provides convenient duct connecting intake grill to exhaust unit, no special costly duct to order. No waiting as 6" pipe is readily available anywhere. Installations on exterior walls require no duct.
- Balanced back draft damper automatic in operation—no shutter to open—no chain to pull.
- Handsome small polished aluminum intake grill readily lends itself to any interior kitchen color scheme—easily cleaned. Patent Pending.

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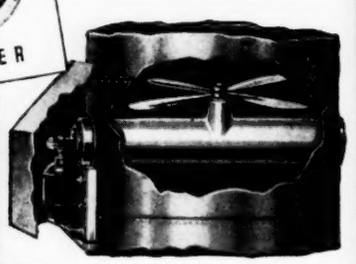
***Solve your Ventilating Problems with "INTERNATIONAL"***

***DUCT BOOSTERS STACK FANS AND BLOWERS***

DUCT BOOSTER



STACK FAN

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ASK FOR BULLETIN No. 99

**INTERNATIONAL ENGINEERING INC.**
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Consolidation of an eight-state area into an enlarged southwestern district of the **Sturtevant Division of Westinghouse**, with headquarters at 411 North 7th St., St. Louis, Mo., has been announced. In charge will be **T. J. Mullen, Jr.**, formerly manager of the division's midwestern district, which is included in the new territory. As part of the reorganization, branch offices will be maintained at Kansas City, Mo., and at Dallas and Houston, Texas.

**A. F. Hinrichsen, Inc.** of 50 Church Street, New York City, sales engineering organization specializing in equipment and materials associated with air conditioning, heating and ventilation, has announced that, to further promote the use and sale of Koolshade for hospitals, industrial buildings, office buildings, etc., it will confine its activities to that particular phase. Its associated company, **The Brown Conditioning Co.** of New Jersey, New York and Long Island, will take over the entire combination storm window business, as well as all the installation work of residential and commercial Koolshade.

**C. F. Suesserott** has been appointed designing engineer of **General Electric's** Automatic Heating Equipment Division at Bloomfield, S. J. Levine, managing engineer of the division, has announced. A graduate of Carnegie Tech, Mr. Suesserott came to G.E. in 1930 where he later became assistant to various plant executives in Schenectady. In 1938, he transferred to Bloomfield as an engineer in the gas heating design engineering section. **R. F. Hertel** has been appointed engineer of General Electric's automatic heating equipment division at Bloomfield. After graduating from the University of Wisconsin, Mr. Hertel joined G.E. as a test student in 1936, and later became section engineer of the standards and development section at G.E.'s Ft. Wayne, Indiana, plant.

# CONVENTION PROGRAMS

## Oil-Heat Institute of America

The Oil-Heat Institute of America has announced the tentative schedule of the Silver Anniversary National Oil Heat Exposition and Convention to be held at Chicago, April 5—8. The exposition will be at the Chicago Coliseum and convention meetings will be at the Palmer House. The tentative schedule follows:

**Monday, April 5**

10:00 a.m. OHI Board of Directors quarterly meeting.
1:00 p.m. Coliseum—Exposition opens.
10:00 p.m. Exposition closes.

**Tuesday, April 6**

9:30 a.m. Annual Meeting, OHI Accessory Division; J. W. Owens, Chairman.
9:30 a.m. Annual Meeting, OHI Distribution Division; J. A. Collins, Chairman.
10:30 a.m. Annual Meeting, OHI; President R. S. Bohn, Chairman.
1:00 p.m. Coliseum—Exposition opens.
1:00 p.m. New Board of Directors luncheon meeting.
10:00 p.m. Exposition closes.

**Wednesday, April 7**

9:30 a.m. Industry Session.

Stephen P. Cauley, Socony-Vacuum Oil Co. **Effects of Revised Specifications on Distillate Fuel Oils**, with E. B. Delgass co-author.

A. T. Atwill, President, Quaker Manufacturing Co., Vaporizing Equipment in 1948.

Fred Hainer, Vice-President, Cleaver-Brooks Co., Package Steam Units.

Other speakers to be announced.

12:30 p.m. OHI Accessory Division luncheon.

1:00 p.m. Coliseum—Exposition opens.

10:00 p.m. Exposition closes.

**Thursday, April 8**

9:30 a.m. Merchandising Session.

Thomas S. Holden, President, F. W. Dodge Corp., Housing in 1948.

Dr. Robert E. Wilson, Chairman of the Board, Standard Oil Co. (Indiana), Burning Oils.

C. M. Daniels, General Sales Manager, Bethlehem Steel Co., Steel Availibility in 1948.

W. A. Matheson, Vice-President Eureka Williams Corp., Williams Oil-O-Matic Division, Equipment Merchandising 1948.

After the speakers are heard, a forum session will be held with a panel including the speakers and the Chairman J. A. Collins; J. W. Owens, Chairman OHI Accessory Division; R. S. Bohn, President OHI; and F. H. Faust, Chairman OHI Engineering Committee.

1:00 p.m. Coliseum—Exposition opens.

5:00 p.m. Exposition closes.

7:30 p.m. Silver anniversary banquet and entertainment.

## COMING EVENTS

APRIL 5-8, 1948—Annual convention and exposition of the Oil Heat Institute of America, Coliseum, Chicago. Secretary, C. F. Curtin, 6 E. 39th St., New York 16, N. Y. *Program on page 152.*

APRIL 5-8, 1948—1948 conference and exhibition, sponsored by the National Association of Corrosion Engineers, Hotel Jefferson, St. Louis, Mo. W. Z. Friend, chairman publicity committee, 67 Wall St., New York 5, N. Y.

APRIL 7-9, 1948—Tenth annual Midwest Power Conference, sponsored by Illinois Institute of Technology, at Sheraton Hotel, Chicago, Ill. Dean Stanton E. Winston, director, 3300 So. Federal St., Chicago 16, Ill.

MAY 3-7, 1948—1948 convention and foundry show of American Foundrymen's Association, Philadelphia Convention Hall and Commercial Museum, Philadelphia, Pa. Alfred A. Hilbron, Hotel Sherman, Chicago, Ill.

MAY 18-21, 1948—39th annual meeting of National District Heating Association, Hotel Statler, St. Louis, Mo. Secretary, John F. Collins, Jr., 827 N. Euclid Avenue, Pittsburgh 6, Pa.

MAY 24-27, 1948—66th convention and exposition of the National Association of Master Plumbers, Philadelphia Convention Hall, Philadelphia, Pa. Association office 1105 K St., N.W., Washington 5, D. C.

MAY 31-JUNE 2, 1948—Spring meeting, American Society of Refrigerating Engineers, New Ocean House, Swampscott, Mass. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

JUNE 1-5, 1948—Annual meeting, Heating, Piping and Air Conditioning Contractors' National Association, Hotel William Penn, Pittsburgh, Pa. Secretary, Joseph C. Fitts, 1250 Avenue of the Americas, New York, N. Y.

JUNE 20-24, 1948—Spring meeting, American Society of Heating and Ventilating Engineers, Mt. Washington Hotel, Bretton Woods, N. H. Secretary, A. V. Hutchinson, 51 Madison Ave., New York, N. Y.

JUNE 29-30, 1948—Mid-year convention, National Warm Air Heating and Air Conditioning Association, Edgewater Beach Hotel, Chicago, Ill. Managing director, George Boeddener, 145 Public Sq., Cleveland 14, Ohio.

SEPTEMBER 13-17, 1948—Third Instrument Conference and Exhibit, Convention Hall, Philadelphia, Pa. E. J. Grace, Jr., general chairman, Instrument Society of America, 1117 Wolfendale St., Pittsburgh 12, Pa.

DECEMBER 9-11, 1948—Annual convention, American Society of Refrigerating Engineers, Hotel Statler, Washington, D. C. Secretary, M. C. Turpin, 40 W. 40th St., New York 18, N. Y.

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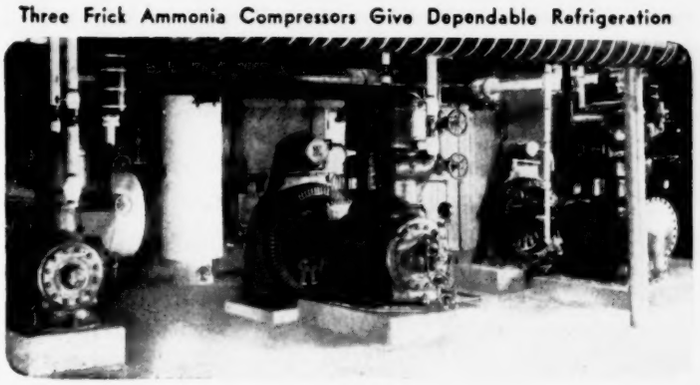

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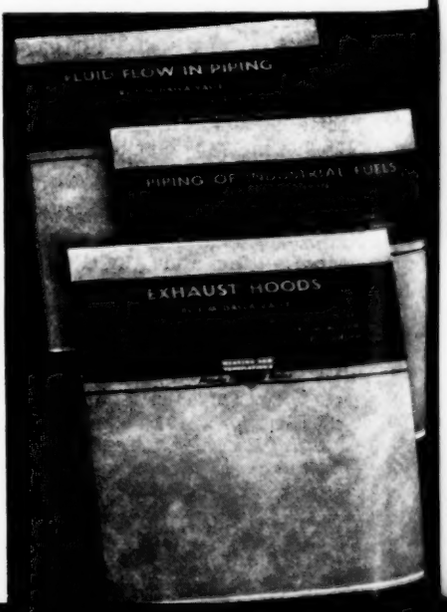


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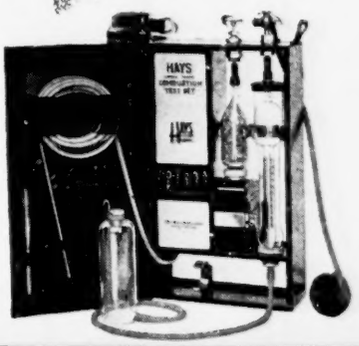


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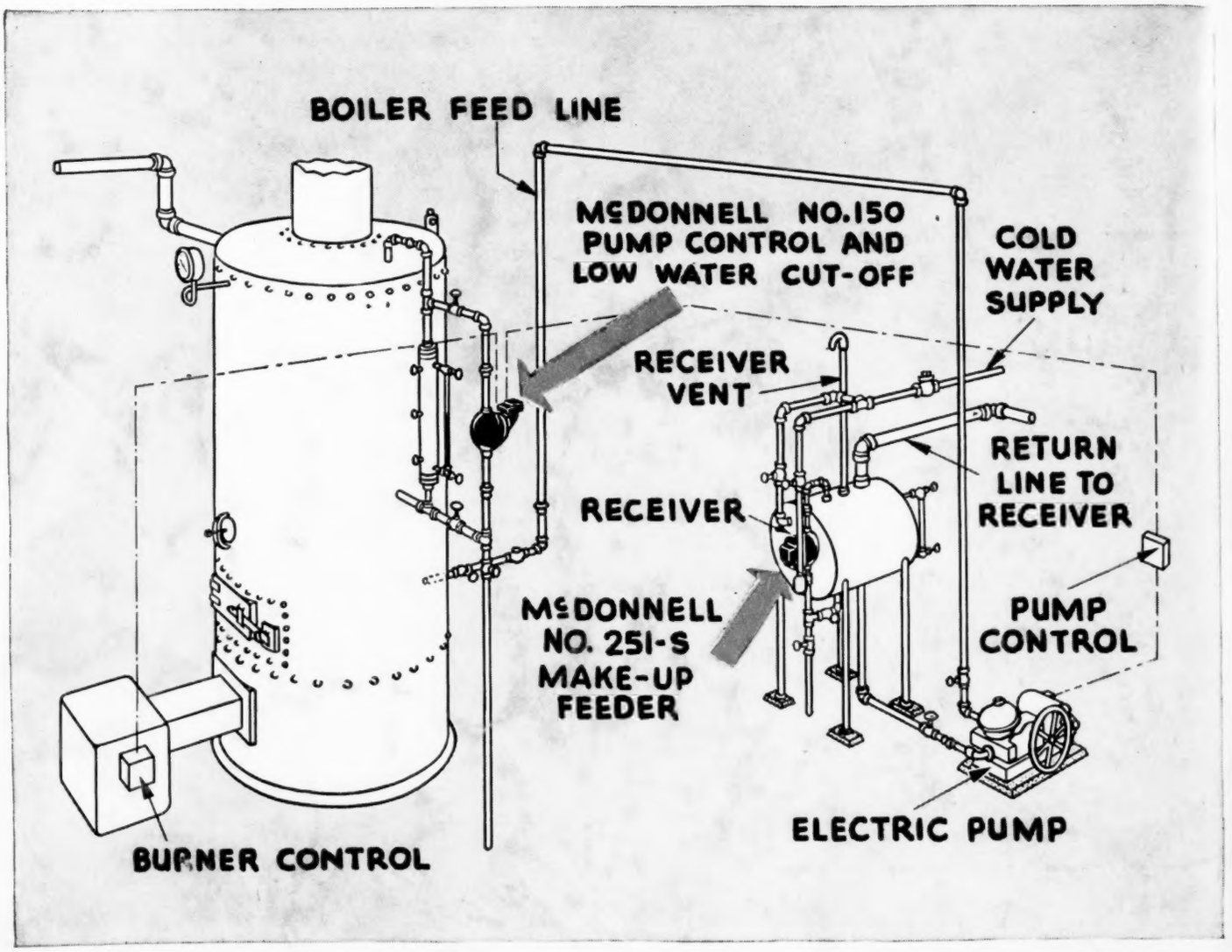


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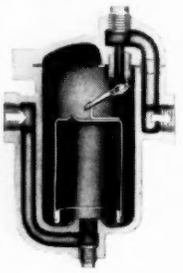
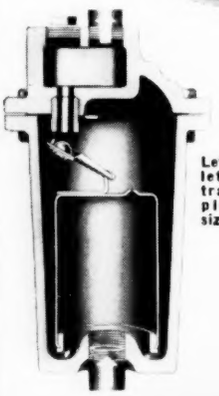
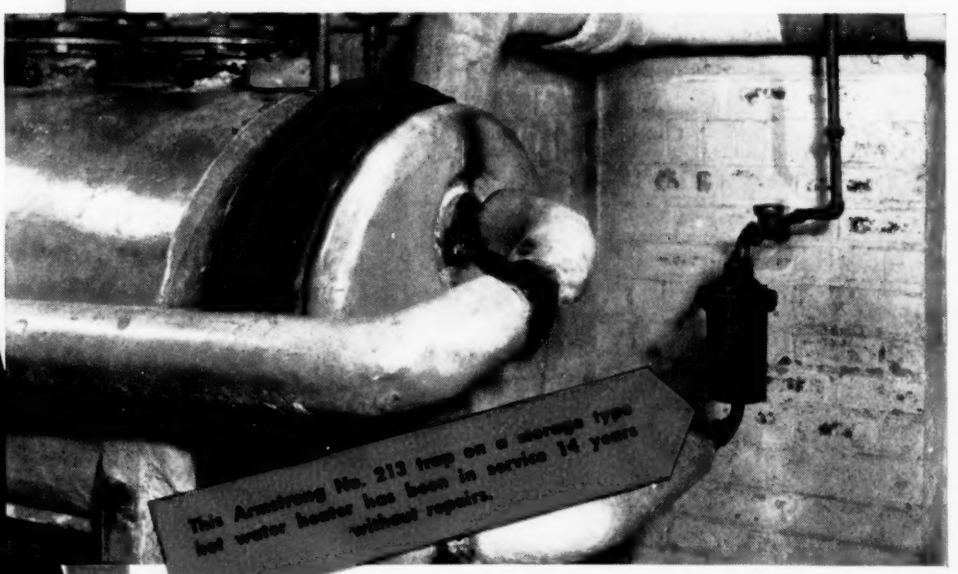


Right: Side Inlet — Side Outlet traps for in-line installation.



Left: Bottom Inlet — Top Outlet traps in a complete range of sizes.



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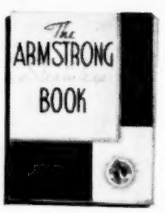


## . . . They're built to stand 1500 psi, 1000°F

The user of standard Armstrong steam traps for medium and low pressure service reaps the benefit of the research, investment and experience that went into the development of Armstrong forged steel traps for high pressure generating station service.

The valves and seats in all Armstrong traps are chrome steel, hardened, ground and lapped to a precision fit. The inverted buckets and valve lever assemblies are all corrosion resistant 18-8 stainless, heavily reinforced for wear. In normal service these mechanisms often last for years without attention. And when a valve finally wears to the point where it fails to seat properly, it is usually good for a relapping—a job any maintenance man can do in a few minutes. Or replacement is a simple, inexpensive job.

It's this built-in quality of Armstrong traps that keeps them on the job without leaking steam, without sticking or clogging, without frequent maintenance. Quality pays dividends when it comes to steam traps. Plan now to standardize on Armstrong, the *quality* traps. Call your Armstrong representative or write:

**ARMSTRONG MACHINE WORKS**

**846 Maple St., Three Rivers, Michigan**

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# ARMSTRONG STEAM TRAPS

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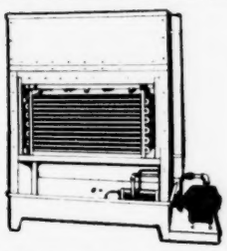
THEY HAVE A TALENT FOR DELIVERING

# What you want – When you want it

●They're pretty down to earth at usAIRco. They carry a slide-rule and know the book on air conditioning . . . but they've blended acceptable theory with sound practice to make a happy combination.

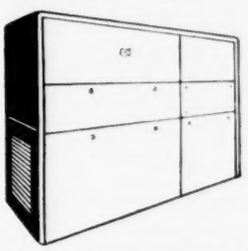
What you receive from usAIRco is competent engineering, good equipment and the type of service that delivers . . . especially in the clutch.

You'll find this 25 year old concern a mighty flexible organization to have at hand to help you do a better job of Airmanship . . . cooling, heating, ventilating, humidity control, refrigeration. Take a tip from a talent scout . . . usAIRco has a talent for delivering what you want, when you want it. Write or phone them . . . and see what I mean. United States Air Conditioning Corporation, Como S. E. at 33rd, Minneapolis 14, Minnesota.



**EVAPORATIVE CONDENSER**

An efficient, economical unit for condensing refrigerants. Also used industrially for cooling, quenching and tempering oils. Permits savings of 95% in water costs.

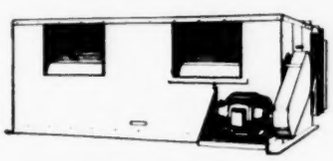


**REFRIGERATED KOOLER-AIRE**

Cooling and de-humidifying units, compressor and evaporative condenser provide a balanced assembly in a single cabinet. Supplied in three sections if desired for easier installation.

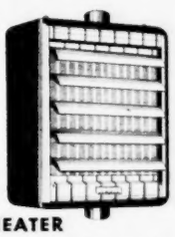
**BLOWERS**

Forwardly curved type ventilating fans are engineered for quiet operation. Backwardly inclined types are designed for installation where non-overloading characteristics are required.



**UNIT AIR CONDITIONER**

Can be equipped to provide one or all functions—heating, cooling, humidifying and de-humidifying. Available in ceiling or floor models in 9 capacities up to 12,000 CFM.



**UNIT HEATER**

Suspension type unit heaters, for use with steam or hot water, provide flexibility of use and low cost operation. All-copper heating element promotes maximum heat transfer.

**AIR-WASHERS**

Single and double stage air washers provide an excellent means of air cleaning, cooling, humidifying and de-humidifying. All steel, arc-welded construction throughout.

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